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A Primer of Agriculture

By HOOK

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A Primer of Agriculture

By

Wallace Hook
Seed Corn Specialist and Institute Lecturer
Packwood, Iowa.

FIRST EDITION.

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PREFACE.

The Primer of Agriculture is intended for the use of teachers in starting work in agriculture in our schools. It contains thirty-six lessons on corn and kindred subjects, one for each week for nine months. In schools where less than nine months of school is provided the lessons may be given oftener so the text could be finished during the year's school work. The contents of each lesson is brought out in an interesting and practical way, which can be easily followed by any teacher.

This work contains many illustrations, which should be studied in connection with the reading matter, and then presented to the pupils in the lecture or story form, supplementing, where necessary, with illustrations and suggestions which will serve to make everything clear in the minds of the pupils. A thorough study of the contents of the lesson prior to the time it is to be presented to the pupils will enable the teacher to keep the interest up to a high pitch which is so necessary to the success of any branch of school work.

If the use of the Primer of Agriculture should result in interesting the boys and girls in the work of the farm the desires of the author will be fulfilled, for this has been the main purpose in publishing the work. To teachers and officers engaged in school work, and all others who are really interested in making our school work more efficient, the inspection and criticism of this book is invited. It is put out solely on its merits and it is the sincere wish of the author that the work be given a fair and impartial inspection.

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LESSON I.

HANGING THE SEED CORN.

A great loss is sustained each year in the corn belt by poor stands of corn. Of the many causes which contribute to this result, the use of inferior seed corn stands out pre-eminently as the greatest. This cause alone costs the farmers of each county several thousand dollars each year, yet, a great deal, if not all, of this loss could be avoided, with very little cost, simply by harvesting our seed corn at the proper time, and hanging it under cover in such a way, that it would dry thoroughly before cold weather. If this were done and, in the spring following, each ear tested, there need be no poor seed corn planted and a great loss would thus be avoided.

The plan of harvesting and hanging the corn is so simple and easy, that we wonder why so many farmers neglect it. Whatever the reason, the fact remains that more than half of our farmers do not give any particular attention to their seed corn. For this reason, I shall ask all my pupils to pay close attention while I show you how to hang up these ears of corn. You see I have some binder twine here. This twine should be of the best quality with no thin places in it to break when the corn is hung up.

Most of you know how to tie a slip-knot. If there are any who don't, you will learn how before our next lesson, I know. Well, you first tie a slip-knot at the end of the twine, and place an ear in the noose and draw it up tight. Next you take hold of the twine, about two inches from the ear, with the left hand and, with your right hand, you catch the twine a little way up and proceed to tie another slip-knot. Place another ear in the noose and draw up tight as before. In this way, you can tie as many ears as you like, but you should not tie more than fifteen or sixteen on one string. Now, about a foot from the last ear, cut the string and tie a knot on the end of the string. Then, by tying a slip-knot in the same manner as you have the others, it makes a loop which will serve as a hanger.

After tying it up in this way, always hang it up by this loop at the end of the string, for you see no two ears touch and each ear of corn gets a circulation of air on all sides and soon dries out. Do not fail to hang it under cover, to avoid getting wet should it rain. You can drive some nails over the drive-

way of the barn, or in the rafters of the crib, and hang it there, but be sure to hang it where there is a free circulation of air.

(Now children, I have shown you how to hang the seed corn. Next

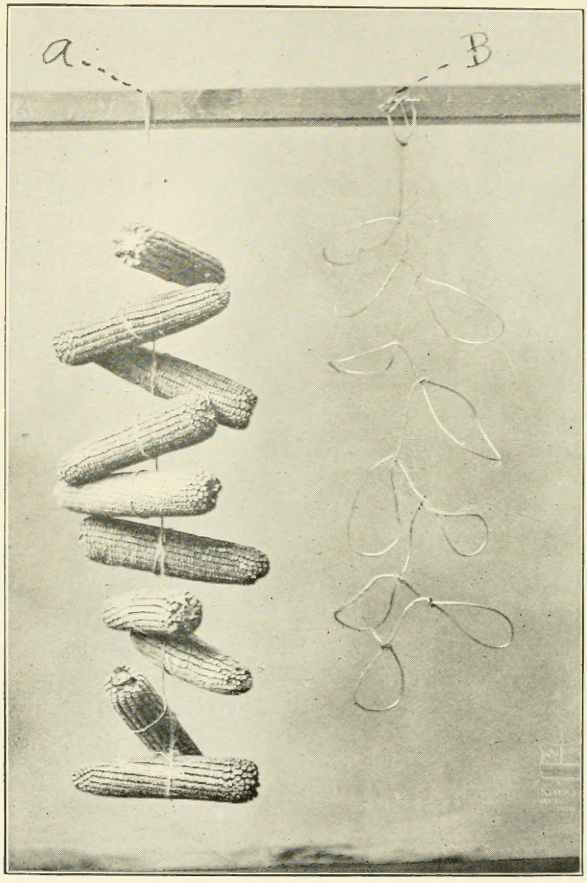


Fig. I. Showing method of hanging seed corn. a, shows method of hanging on a nail. B shows how the twine may be tied so it can be hung on wire.

time, I will give you a lesson on the selection and harvesting of the seed corn, and, in the meanwhile, I wish you would all practice tying up some seed corn and to all those who can do this work like I have shown you, by the time for our next lesson, I will give a perfect mark in your agricultural work. How many of you will try to get a perfect mark?)

LESSON II.

SELECTING AND HARVESTING.

In the last lesson, I showed you how to hang up the seed corn. (How many have learned how to tie and hang it? Well, it was not a very hard job, was it? I am glad so many of you are to get perfect marks.) In the last lesson, I told you I would take up the selection and harvesting. How many of you have ever helped gather seed corn? Well, suppose our school here was to have the task of picking and hanging all of the seed corn in this school district. We will say that there will be planted, one thousand acres of corn, and that one bushel would plant seven acres, as it will; you see it would take nearly one hundred and fifty bushels to plant it all. This would

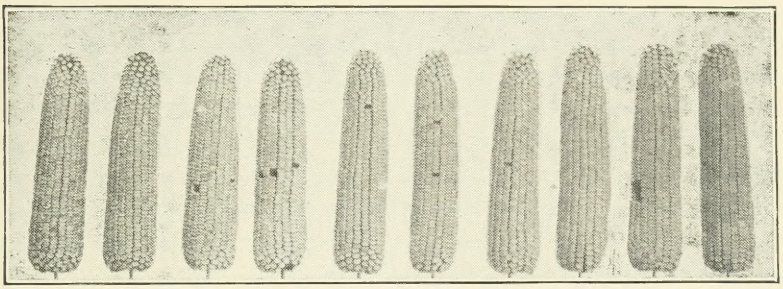


Fig. II. Proper selection of corn. Note the uniformity in size and shape of ear. All ears have same number of rows and the kernels are all so near the same size that the planter would drop them evenly. These are the kind of ears to select for the seed patch. This sample was shown in 1907 and won over $200 in premiums.

be quite a task for our school to accomplish, but not so much of a task for each farmer to hang his share. (How many farmers in this school district?) To illustrate, we will say that there are twenty-five different farmers, then each would have forty acres of corn, requiring six bushels of seed corn. Now, to be sure and have enough to plant a second time, should worms or cold weather prevent getting a stand, as they sometimes do, each of those twenty-five farmers puts up twelve bushels of seed corn; it would not take him more than two days to do the work. Don't you think it would pay any farmer well to take two days time for this work?

Now, children, I am going to ask you all to try to persuade some of your folks at home to take a couple of days time and go with you and make a selection of your seed corn from field. This should be done in the month of

September. (Early in the month in the northern states, and later as you go south.) By making the selection from the field, we can study the stalk as well as the ear. The husks should all be brown and the kernels well dented. That is, the tops of the kernels should have creases or dimples in them, and should be fully past the roasting ear stage. If it is too soft, the corn is very apt to mould or sprout, and thus spoil it for seed. Of course we will pick the finest looking ears; those that have the best shape and are covered with kernels that are all as near as possible of the same size. We won't waste our time on ears with pointed ends or irregular-shaped kernels, because they are very apt to produce the same kind of corn when planted for seed. (In subsequent lessons, we will take this point up further.)

Now as to the stalk, we should never take seed from a weak stalk or from one that is leaning or broken down. Neither should we take an ear from a damaged or smutted stalk. The stalks should be strong and vigorous, of medium height, and bearing the ear from three and one-half to four and one-half feet from the ground. The shank of the ear should be so shaped as to allow the ear to hang tip end downward, (never upward) so as to shed the water when it rains. A large shank is to be avoided as it indicates a large cob and is also hard to break off in husking. When we find this kind of plant, we will strip back the husks and, if the ear fulfills our requirements, we will husk it and put it in a sack hung over our shoulder and proceed in this way until we get all the seed we want. Now remember, it must be hung up at once and not left to lay in piles, because it soon spoils when it is picked at this time of year and left in piles or boxes. I will close this lesson by asking you to observe closely while you are gathering the seed corn, so you will be able to write me a story on your "Experience in Picking Seed Corn." I would like if you would bring a few of the ears to school with you to use in future lessons. Pull up the stalks and bring them along. We can husk the ears and hang them up right here.

LESSON III.

FERTILIZATION OF CORN.

I see most of you have brought stalks of corn to school with you, so in this lesson we will study the fertilization of corn and it may be we can understand why some ears are better than others. First, I might say that corn belongs to the family of grasses the same as wheat, oats, rye, barley, timothy,

blue-grass, foxtail, red-top and many others. How many have noticed corn when it first comes up? Well, it looks like a little hollow green tube doesn't it? All of the grasses look the same way only they are smaller.

After corn attains its full height, tassels appear at the top of the stalk, as you see in these we have here. Not long after the corn tassels out, the shoots appear at the sides of the stalks. (What are these shoots?) A little later the silks show themselves at the ends of the shoots. If you should open the husks at this time, you would find a miniature cob and you would also find that the silks were attached to this little cob. On closer examination, you would find them arranged in rows just as the grains of corn are arranged on an ear. About this time, an interesting thing happens, and I will try to explain it to you.

How many of you have noticed flowers when they were in bloom? Well, the corn plant blooms too, and where do you suppose the flowers are? Well, they are on the tassel and are called the male flowers. How many of you have noticed little objects hanging from the tassels? Well, these are the pollen sacks and they are filled with pollen grains. They are so small that when these pollen sacks burst open, these grains look like little clouds of smoke or dust, except that they are brown in color. These little grains are floating in the air all over the cornfield and there are millions of them. Sometimes the wind carries them quite a distance into other cornfields. When they alight on the silks, which are the female flowers, fertilization takes place in this manner: As soon as the pollen grain touches the silk it sends a small thread-like shoot down through the center of it until it touches the ovule, which is in the cob. When it gets this far, fertilization takes place and the silk begins to dry up, and the grain of corn begins to form. It rarely, if ever, occurs that all of the silks are fertilized and this accounts for some ears of corn having more irregular-shaped kernels than others, for if any silk fails to fertilize the grains nearest to it spreads out to fill the vacant place and in so doing becomes irregular in shape. Sometimes only a few of the silks are fertilized, and we have ears of corn with only a few grains on them. Remember, there will be no kernels form unless the silk is fertilized. This explains why some ears do not fill well over the ends.

We find that the tassels and silks and these little pollen grains are very essential in the production of corn, for without them we would have none.

Fig. III. Showing desirable and undesirable stalks a short time after the ears have formed. 1 is too tall and the nodes too far apart for strength. The shank is too short and the ear is too high on the stalk. 2 shows ear hanging in proper position and at about right height. The nodes are about the right distance apart. Notice the brace roots at the two lower nodes. a, tassels or male flowers. B, silks or female flowers. C, internodes. D, nodes

LESSON IV.

STRUCTURE OF THE CORN PLANT.

While we have a stalk here, let us see how it is made. You see it has joints. Each joint has two parts: the enlarged portion at the end, called

node, and the remaining portion between the nodes, which is called internodes. (How many joints on a stalk). On some stalks, these joints are long and on others, short. As these joints give strength to the stalk, they should not be too long or slender, but rather should they be short and thick. You will notice that the ears are born at the nodes on shanks or stems that are also made up of joints much like those on the stalks. (The ear, to be at about the right height from the ground, should be born at the sixth or seventh joint.) Now these joints on the shanks should be just long enough so the shank may curve over so the ear will hang tip-end downward. Some are so short that the ear sticks up and then when it rains, the ear takes water inside the husks and spoils. As we said in a previous lesson, the shank should not be too large as the ear would then be hard to break off when we come to husk it.

Did you ever observe at husking time, that some ears are covered over well with husks, while some are not so well covered? (Which do you think would be the better?) You will see that those that are covered are not damaged by birds and insects like those that are left exposed. Neither are they so apt to have smutted grains on them because the kernels are too well protected by the husks. Of course, the husks should be loose enough at husking time so the corn will dry out readily and be easy to husk, but there should always be enough of them to cover the ear well.

If we take a knife and cut a stalk into two pieces, we can tell something of how it is made. The outer part is very hard and stiff, while the inner portion is of a soft, spongy nature which we call pith. The outer shell or covering gives strength to withstand the wind, while the pith merely serves as plant tissue through which the sap flows. This spongy part is used for packing material in large battleships because it is light and very hard to penetrate, although heavy guns are used. This pithy substance also fills the shanks we have spoken about and is present also in the hollow of the cob. You see, it forms a very important part of the corn plant.

We have seen how important the structure of the stalk is to the strength and producing power of the corn plant. We find that those stalks that are strongly built are able to withstand the wind, while the ears that are best protected, escape the damage by birds, insects, and rainy weather. If we fully understand all these things, we are better able to choose the best ears for seed. I hope you will all study the points considered and, in our next lesson, we will take up the root and leaf system and I will endeavor to show you how the plant gets its nourishment and how important it is to feed the corn plant well in order to get the largest yield as well as the fullest development.

LESSON V.

HOW THE CORN PLANT GROWS.

You have all watched the pigs, the lambs and the chickens grow, and understand that it is necessary to feed them well in order to get the greatest growth. While corn-plants must be fed and growth encouraged, we find that they feed in a much different way. They take their nourishment almost wholly through the roots. This is why we speak of the roots as the mouths of the plants.

When a live grain of corn is planted under favorable conditions, it germinates, sending up a shoot called the caulicle, which is the stalk. It also sends a shoot downward and this is called the radicle or root. Now each grain of corn contains enough plant food for the little corn-plant to live on, until it is large enough to get its nourishment from the soil, and the corn plant usually absorbs all of this nourishment before it ceases, leaving nothing of the kernel but the empty hull. By this time, the roots are well established, the leaves have formed on the caulicle and the plant is ready to take care of itself.

The corn roots get their nourishment by sending out rootlets which are covered with small root-hairs. These come in contact with the soil particles and absorb the soil moisture which contains the plant food in solution. By this I mean that the plant food is mixed through this soil-water. When these root-hairs get all the soil moisture, within their reach, they die off and other rootlets are sent out at other places on the roots, so that by the end of the growing season, these roots and root-hairs have covered most of the soil immediately surrounding the plant, and to the depth of a foot from the surface. Hence, we see the importance of thorough surface preparation for the best development of the corn plant.

When the roots take up this soil-water, it passes up through the pith of the stalk into the leaves, where it is manufactured into plant tissue. This is done by the action of a green substance, called chlorophyl in connection with oxygen, which is taken into the leaf through breathing pores on the underside, which are called stomata. Thus we see that the leaves are the lungs and digestive apparatus of the corn plant. We often hear the expression that the leaves are the manufacturing part of the plant. It is because the plant food is changed to plant tissue in them, and the surplus stored up as starch to be later used in the production of the seed.

While we found that the stalks should be strong, we also see why it is important that the root system should be strong also. When the corn plant gets about four feet high, it sends out roots at, or a little above the surface of the ground. These are called brace roots, because they help to keep the stalk in an upright position. These are very important and care should be

taken in cultivating large corn that these roots are not injured. Sometimes, the corn root worm cuts these roots off and then the corn blows down easily. For this reason, corn should not be grown on the same land more than two years in succession.

In conclusion then, the corn plant, to do its best, must have a rich, well-prepared soil which is well drained, so as to allow of plenty of air in the soil. It should have plenty of warmth and sunshine as the chlorophyl does not seem to do its best work in cloudy, cold or too dry weather. This accounts for the pale yellow color in corn when we say that corn is not doing well. Corn should have a rich, dark green color and maintain this color throughout the growing season or until the seed is matured. Then the leaves turn brown and the plant dies. Should a frost come before the plant is fully matured, the leaf structure is destroyed and the plant dies before it should. This results in immature, chaffy corn. For this reason, corn should be planted early enough in the season so it will have time to ripen before frost, or if planted late, an early variety should be used. We cannot expect a full crop unless we do our part in providing the conditions under which corn does its best. We have learned in this lesson, some of the things that are vitally important in securing the best conditions of plant growth. Let us see how many of us can tell, in a month from now, "How a Plant Grows."

LESSON VI.

COUNTING THE STAND.

In this lesson, we will take up a method by which we can determine the stand of corn in any field. We will count the stand in two hundred hills, fifty hills four different places in the field. We will take the rows the opposite way the corn was planted in checked corn, and the same way it was planted in drilled corn. As there is more corn checked than drilled, we will take up the counting of the checked corn first and it will be necessary for us to make a record sheet to record the stand of each hill.

You may take a piece of paper from your note book and rule it off checkerboard fashion ten squares one way and twenty squares the other. Now turn your paper like you would if you were writing a letter, and above the upper left-hand square (not inside but above) place figure one, which means that inside this square is where you are to put the number of stalks you have in the first hill counted. Now from square number one, number the squares to the right in just the same manner. Thus you see you have the figures 1, 2,

3, 4, 5, 6, 7, 8, 9, 10, just above your first row of squares. In these squares is where to place the number of stalks that you find in each of the first ten hills counted. To illustrate: Suppose you find the first hill contains two stalks, then you place the figure 2 in square number one. In the second hill are three stalks, then you place the figure 3 in the second square. If the third hill is missing, you place a zero mark in square number three, and so on, until you have counted ten hills and have recorded the number of stalks in each of these first ten hills. The next ten hills, we will record in the squares just under the first ten squares, hill eleven under square one, hill twelve under square two, and so on. Then the third ten hills will be recorded in the third row of squares; the fourth ten hills in the fourth row of squares, and so on until you have counted the stand in two hundred hills. For convenience, we will number each row of squares just to the left of it, which will make it easy for us to locate any particular hill.

As I said in the beginning, we would count fifty hills in four different places in the field and that we would count the hills the opposite way that the corn was planted. We will count the hills as they come and take all fifty hills on the same row. You may keep account, if you wish, the number of barren stalks, broken stalks, or those that have smut on them. Keep these in separate columns and not in the squares. You will, no doubt, be surprised at the very poor stands you find in some fields and the very good in other fields. If you were to follow up this point, no doubt you could find a reason for it.

In counting the stand in drilled corn, it will be necessary to take our tape measure and measure one hundred and seventy-five feet on each of four rows in four different places in the field. This will give the equivalent of two hundred hills of checked corn. Instead of having squares to record the number of stalks, all that will be necessary is to keep account of the number of stalks growing in the distance measured off.

To figure the per cent of stand in either case, divide the total number of stalks in the two hundred hills or the seven hundred feet of drilled corn, by six hundred, which is 3 stalks in each of the two hundred hills, which will give the per cent of stand. In the same manner, you can find the per cent of barren, broken or smutted stalks. For instance, in one field we count 480 stalks, and of these, 48 are barren, 18 are broken and 17 are smutted. By dividing 480 by 600, we have 80 per cent of stand. In the same way, we find 8 per cent are barren, 3 per cent broken and 2 5-6 per cent smutted. Before our next lesson, see how many can find time to count the stand in your fields at home. You can tack your count sheet on the face of a smooth board, which will make it easy to carry. Be as careful as you can; make

your figures plain. You can then copy your work neatly on another piece of paper and we will make a book of these count sheets. If you will all try we can get a count of each field of corn in our school district. From this we can easily figure the average stand. (I shall try to go with you and make a count of the first field, so you will all understand fully how to do it.) The one who brings the neatest report, we will appoint our captain in this excursion work, so try hard and see who will win the position.

LESSON VII.

STUDYING THE EAR FOR VITALITY.

In a former lesson, we took up a study of the stalk. In this and future lessons, we will make a study of the ear. Each pupil will study his own ear and you may use any one of the ears you brought with you and have hung up here in the school room. We will not take up a study of the score-card as most of the states have different ideas on the value of the various points of an ear of corn. What we wish to know is the essential characters that go to make a good ear of corn, regardless of the score-card.

Now, the first thing that an ear of corn must have in order to be good for seed is vitality. I mean that it must have kernels in which the germ is not only alive, but is of strong vitality. Most ears that are hung up as these have been will have good vitality but sometimes we make a mistake and hang one that is too green and the vitality is not strong enough for seed. Of course, if we would test each ear of corn, we could get rid of these poor ears, but a great many who hang up their seed corn, will not test it, so we will see what we can find out about vitality, by studying the ear itself.

You may each remove two kernels from your ear of corn. Do not take the point of your knife-blade but place the edge of your blade between two rows and, by prying easily, you can lift a couple of grains up sufficiently that you can get hold of them with your other hand. Take these kernels from the center of the ear, and place them in front of the tip end of your ear. Have the butt of the ear toward you. Now we are ready for work.

Ears of strong vitality will generally be solid and heavy and especially will they be so if hung up early and dried out as these have been. The kernels should have a bright color and not have any cob chaff adhering to the tip ends nor should they leave the tip-cap in the cob when you remove them. The back of the kernels should not be blistered nor the germ be wrinkled. The kernels should not show any moldiness nor starchiness. The

starch is the light-colored portion at the crown and back of the kernel. When you cut through the kernel, this light colored portion looks like starch, while the harder portion is more transparent. The more of this hard portion a kernel possesses, the stronger the vitality is likely to be. Ears of strong vitality are seldom chaffy. By chaffiness, I mean that the kernels are badly shrunken and when you rub your hand over the surface the kernels rattle something like the teeth of a comb would by drawing a pencil across them. The kernels should be full and plump at the tip, so as to give plenty of room for a large germ. The germ is the oblong depression on the face of the kernel. It should be large and have a bright appearance and when the covering is removed, you can see the embryo corn plant. The part extending toward the tip of the kernel is the root and the part extending toward the crown of the kernel is the stalk. It does not make any difference what position the kernel is placed in the ground, the root sprout will always grow down into the ground while the stalk sprout will come up toward the surface. (What was the stalk sprout called? And what was the root sprout called?)

This embryo plant should never have a dark or amber color but should be bright in appearance and always have a light color. Not even any part should be discolored as this indicates weak vitality. Frozen germs will be soft and have a dark color resembling butter. This darkness very often shows through the kernel covering, making it quite easy to distinguish the bad from the good. Mouldy grains will have a bluish color and when cut open the germs will have a cheesy appearance. Chaffy grains may have live germs but they do not have sufficient plant food for the young plant to live on until it can get nourishment from the soil. These should generally be discarded, or, if used, they should be planted late in the season.

While it is easy enough to tell these dead kernels by inspection it is not so easy to tell just when a kernel is good, so the safe way is to test each ear separately and discard those that do not germinate strong. But if we are able to tell the bad ears by inspection, we can throw them out without testing, and thus save a great deal of work. We will take up in another lesson, methods of testing corn in which we will make a close study of what actually takes place when a kernel of corn germinates. But between now and our next lesson, you may each of you examine some ears of corn at home and if you find any that you think are poor in vitality, you may bring them to school with you and we will compare them with some of these ears that we are reasonably sure have good vitality. In this way, we may, by diligent practice, learn to distinguish the bad ears and thus be able to help in a practical way to select the seed corn at home.

LESSON VIII.

STUDYING THE GENERAL APPEARANCE OF AN EAR.

While an ear of corn must have vitality to be fit for seed, all ears of strong vitality are not desirable for seed, because of other defects, such as irregular shaped kernels, too small or too large grains, large cobs, mixed color or poorly filled ears. So, in "Under General Appearance," we will take up the size and shape of both the ear and the kernel, the filling of the ear, the uniformity of the kernels and the straightness of the rows. We will also deal with the dent type of the kernel.

The size of the ear will, of course, vary with the variety, and with the locality in which it is grown. For the northern part of the corn belt, an ear from six to nine inches long is about right for dent corn. For the central portion eight to ten inches long will be about right while in the southern part, the length of ear may reach from nine to twelve inches and even longer.

The circumference should be about three-fourths of the length except in varieties like Longfellow, which grows a long slender ear, and other varieties which grow a short thick ear. The dimensions of an ear should always conform to the variety which it represents. The main point is to avoid picking for seed any ear that is too large to mature in an average season where it is to be grown.

An ear of corn should be so shaped that as many of the kernels as possible will be the same shape and size. This requires an ear to approach the cylindrical in shape although it should taper slightly. The rows should be straight, but if the kernels are fairly uniform this is not so important. The butts and tips should be well filled with kernels as near the shape and size of those in the central portion of the ear as possible, so that the planter will drop them evenly.

The kernels should be of a broadly rounding wedge shape and should be so arranged that they fill all the space on the cob. Small kernels are objectionable because they usually produce small, weak plants. They are also hard to plant, without getting too thick a stand. Large grains are hard to plant, although they usually produce well. Grains of irregular shape and sizes should be discarded as it is very hard to get an even stand with them.

The dent type varies with the variety but should not be too rough as it makes the corn bad to handle. The rough dent is of no advantage so in selecting our seed, let us just discard those of this type. The smooth dent will not be so disagreeable to handle but is not desirable as it indicates a lack of full development. The plant either lacked vitality or suffered for want of moisture when maturing. The crease dent or medium between the rough

and dimple dent is the most desirable in most varieties, so we will discard all except this kind. That is, we will not pick the very rough or the very smooth dent, then we will not be so apt to have so much of this kind in next year's crop. While we are paying much attention to the stalks from which we pick our seed corn, we can also eliminate the type of ear that does not satisfy us from the standpoint of general appearance. If we learn to recognize a good ear at sight, it will be by closely observing its general appearance, and by handling the ear so as to determine something of its weight and maturity. The more we handle corn, the quicker will we be able to tell whether it is good or bad, so don't be afraid to examine an ear of corn any time, keeping in mind what we have taken up in class and I am sure you cannot fail to profit by it. If any of you should find an exceptionally good ear in general appearance, bring it with you to school and we will label it as such, and use it to compare other ears with. In this way we can get an ideal fixed in our mind which will help us in our selections.

LESSON IX.

STUDYING THE EAR FOR MATURITY AND PRODUCTIVENESS.

Ears of corn are mature when they ripen fully. While it is comparatively easy to tell a mature stalk of corn, it is not quite so easy to tell a mature ear. There are some things, however, about an ear of corn that will enable us to recognize maturity. Mature ears are always solid and heavy and are seldom very starchy. The kernels fit closely on the cob and carry their depth well throughout the length of the ear. Ears that taper too much, indicate a lack of full development, sometimes caused by the weakness of the plant, and sometimes caused by lack of sufficient moisture, or plant food in the soil. Large, solid, well-filled ears, which approach the cylindrical in shape and are full in the central portion, indicate full development and should be kept for seed.

Characters which indicate productiveness are maturity, strong vitality and a large shelling percentage. We understand pretty well what to look for in maturity and vitality, so we will now study those characters which indicate high shelling percentage. Corn, to shell a high per cent of corn, must necessarily have a medium to small cob, well filled with uniformly deep kernels. The kernels should have no space between them and the rows should lay close together. The ends of the ear should be well filled although it is not necessary for the tip end to be completely covered. The grain should be free from

starchiness and chaffiness as this kind of corn lacks weight and feeding value. The most productive corn should not only be the best seed corn, but it should also be the best corn for feeding purposes or for the market.

In localities where the season is short, it is necessary to grow early varieties. These, of course, will not have deep kernels and some varieties will have a large cob. We need not expect high shelling percentage in these varieties. The yield must necessarily be made up by thicker planting, that is, growing smaller ears and more of them. In localities where the seasons are long, we can mature corn with larger ears, with deeper kernels, and, consequently, higher shelling percentage.

While it should be our desire to grow as much corn as we possibly can, it is not advisable to grow corn with too deep kernels, as they do not dry out so readily, even though they get ripe. Corn should not only mature, but it must dry out thoroughly before cold weather, in order to be good seed or keep well in the crib. It would be better to plant early varieties a little thicker than to run the risk of maturing too late varieties. Maturity is very essential from the standpoint of seed, feeding value, and for market. The starch factories can use immature corn, but never at a mature corn price.

While immature corn can be fed to good advantage on the farm, it is difficult to store so as to keep it from spoiling, especially in warm weather. It should not be cribbed until late, and then it should be placed in slatted cribs that are not too wide. It is sometimes a good plan to set a row of posts through the center of the crib to keep the corn from settling down too close. These afford avenues for the escape of moisture as the corn dries, and, in many cases would be the means of saving much corn that otherwise spoils.

From this lesson, we have learned why it is important to know mature corn from immature. We should, with a little practice, be able to judge this point with accuracy. It is folly to spend a whole season's work growing corn that will not ripen. Not only do we lose out from the standpoint of yield, but we are also liable to lose the whole crop by having it spoil. Spoiled corn is unsafe to use as feed for any kind of stock, so the safe way is to discard those varieties which do not mature in the locality where they are to be grown.

LESSON X.

STUDYING THE EAR FOR BREED CHARACTERISTICS.

Under this heading, we will take up only those things that will enable us to discard those ears that do not conform to the variety they represent. Yel-

low corn should have red cobs, while white corn should have white cobs, and every ear found that is lacking in this point, should be discarded for seed, especially when it is desired to keep the corn pure. Some white varieties have red cobs like the St. Charles White but all the cobs are red and a white cob should be discarded. This is an exception to the general rule as the reverse is true in most of the white varieties.

The color of the grain is a very important point in the study of breed character and it requires considerable study to be able to know and recognize the different shades. To illustrate: Reid's Yellow Dent has a lemon yellow color, while Leaming is more of an orange yellow. Boone County White is pearly white, while Silver Mine and Iowa Ideal are more of a creamy white. Neither yellow nor white corn should have mixed grains nor contain red or streaked ears. This shows lack of purity and poor breed character.

Each variety of corn has a distinct color, type of dent, size and shape of both the ear and kernel, and to be true to type, each ear should conform to these characters. The arrangement of the rows are also different in the varieties, as in most varieties the rows run in pairs, while in some, as the Golden Eagle, the rows run singly. Should you find a single-rowed ear of Reid's Yellow Dent or Legal Tender, you would say it lacked breed type, while the reverse would be true in the Golden Eagle.

To illustrate what we mean by the rows being arranged in pairs, let us examine the rows on the ears we have here. Now, if the rows are paired, one furrow will be more open than the one next to it. The kernels on each side of the furrow have straight edges and set opposite each other. Let us see how they set in the next furrow. You see the kernels do not set exactly opposite each other, but are set zigzag fashion, making a furrow which resembles a saw blade. The kernels are said to dove-tail in every other row in the double row varieties and the kernels are slightly rounding at the tip ends on the side where they dove-tail. You notice that the edges of the kernels on this side are not straight but are V shaped. This is a feature which often helps to identify one variety from another after all other means have failed.

If we were to take up each variety, separately, we could make a closer study of this point of breed character but, as we have so many varieties and not all have the same kind even in this school, we have simply taken up those general points which will help us in the study of our own kind of corn. We should know something about the variety we are growing, its color, shape of ear and kernel, and be able to tell those ears that do not conform to the variety type. Further than this, we would have to make a close study of each

variety separately and the knowledge gained would not particularly benefit us unless we choose to grow those varieties.

We have now completed the study of the ear and are ready to put our knowledge to practice. Suppose we have a contest and see who will bring the best ear of corn for next lesson. You will keep all points in mind and remember, the best all round ear will be given first. Get your folks at home to help you, and see who will bring the best ear. I know some of you will bring in good ones.

LESSON XI.

JUDGING CORN, SINGLE EARS.

In the last lesson, we decided to have a little contest and I see you have all responded nicely and we have a number of ears of corn here that are all pretty good. We will first lay them along in a row and take two kernels from each ear and place in front of it. Now take an additional kernel from each ear and let us see if it will grow. Should we find any that will not grow, we will discard that ear. (How many dead ears have we?)

The next thing we will look for is ears with irregular shaped grains and those that are not the right shape and size. As we are to pick the best ear, the best plan is to eliminate those that we are sure do not come up to the standard. If we have any loose, chaffy ears or ears that are too small or too large, we will throw them out. (I hope we will not find many of this kind.) Starchy ears we have found to be undesirable, so look out for them.

Before we go any further, let us number each ear from left to right and then each of us examine all of the ears and write down on a piece of paper, the number of the ear we think is best. Of course, we will not talk to each other, but will give our own judgment as to which is best. Look closely and see if any of the yellow ears have white cobs or if the white ears have red cobs. Notice closely the shape and uniformity of the kernels on each ear. You know the best ear is the one that has the most good grains on the ear and are as near as possible of the same size. Notice closely how well matured each of the ears is. Are any of them mouldy or chaffy? Note well the filling of the butts and tips. Are the butt and tip kernels of the same size and shape as those in the middle of the ear? If not, they should be. Is the shank large? If so, the cob might be large and the shelling percentage low. Are the kernels plump and are the germs large and bright in appearance?

By this time, you will have decided which is the best in your own estimation so you may hand in your numbers. If any number appears more than

once, we will consider it one of the contestants. I find three ears have more than one vote. Number three appears the most number of times, so we will see if three is really the best. By close inspection, we find this ear is strong in vitality, has the best shaped kernel and more kernels that would be good to plant than any of the other ears. The kernels are also of uniform depth, width, and thickness. The rows are paired and run reasonably straight and the kernels fit close together, and all in all, the ear is solid and mature and has very little starch. I think I should rather have number three myself than any of the others.

Well this has been quite an interesting contest. (Whose ear won first?) Let us look at this ear closely. Suppose we weigh it. We will also count the number of rows and the number of kernels in a row. Now, by multiplying the number of rows by the number of kernels in the row, we have the total number of grains on the ear. (How many?) I hope you will keep the type of this ear in mind and, in the future, when you find an ear that looks like it, save it. Ten ears as good as these would win a prize in almost any show. Suppose you try to find a ten ear sample. I will give you a week to get it and will be glad to help you any time that I can. Get the ears as near alike as you can but be sure to have the kernels alike as this is more important. Kernels that are uniform will plant well together and that is more important than to have the ears of the same size and the kernels of different sizes.

LESSON XII.

JUDGING CORN, TEN EAR SAMPLES.

We will need a longer table for our judging work in this lesson for we have ten ear samples instead of single ears. Let us number each sample and also number each ear in all of the samples. Ear number one will be the left hand ear in each case, and number ten, the right hand ear; that is, when you stand before the sample with the butts of the ears toward you.

We will proceed as we did last week and remove two kernels from each ear, and examine a third one for vitality. It is the rule that if more than two dead ears are found, the sample should be disqualified. All samples should be more than seventy-five per cent perfect, if they receive a premium in the show. We do not expect these samples to be good enough for show purposes, but we do expect them to be good seed corn, and that some will be better than others.

As I told you last week, it was more important to have the kernels of uni-

form shape and size than it was to have the ears so, but of course, if you can get both the ears and kernels uniform, it will be all the better. Suppose we examine the kernels of each sample for uniformity of shape and size. Do you find any that are badly off in this respect? If so, we will lay that sample aside. In the same way, we will lay aside any sample that is too large or too small. Have we any chaffy, immature or starchy samples, or any ill-shaped ears, with irregular shaped kernels? By going over the samples carefully, we may be able to cut out all but two or three of the best.

Now in order to finally decide which is the best, we will take a vote the same as we did last week on the single ears. Each one will study the samples closely and record the number of the sample that you think best. When we have all decided we will see which samples are the best.

Well, we find sample number four, seven and one have the highest number of votes, while two, six and five each have one vote. Sample three did not receive a vote, so it must be the poorest. We will see why four, seven and one are the best, if such is the case. After looking two, five and six over, I believe they are poorer than the other three. But which of the three is best? Well suppose we compare sample four with seven, ear for ear. Ear number one, of sample four, with ear number one of sample seven. In the same manner, let us compare the second ear of each sample, then the third, and so on until we compare all ten ears. By this method, we find sample seven to have the most good ears so we will compare it with sample one in the same manner. Suppose we find it has more good ears than sample one, then we give sample number seven first place. How many agree with this placing? Well this is the correct way to judge samples of more than one ear.

To be sure we are absolutely correct, it is best to place the ears in each sample according to their merit, with the best ear to the left and each of the others next to it according to its merits, with the poorest ear to the right. Now, by comparing ear for ear, we have the best ear of each sample against each other and the next best ears against each other, and so on all the way through the sample. This makes the comparison reliable and, in most cases the placing will be correct.

While it is not absolutely essential that we know how to judge large samples of corn, yet this work will help us in picking out the choicest ears for us to use in planting our seed patch. We should try to get forty or fifty ears for this purpose and in next lesson, I will show you how we may test these ears for vitality in a way that is both easy and simple.

LESSON XIII.

TESTING THE SEED.

In this lesson, we will take up a method by which we may test our corn to determine its germinating power. While a great many farmers do not believe it is necessary to do this, we all know, or should know, that testing the corn will not hurt it any, and it will be a great relief to us to know absolutely that

Fig. IV. Showing method of laying out corn for testing. By placing laths between the rows the corn could be laid out in a small space. By numbering the rows and the ears in each row to correspond with the squares in the germination box any ear that proved bad in the test could be located easily and accurately. a, laths used to separate the rows. A wide board would do as well.

the seed will grow before planting it. The work should be done in March or earlier when other work is not pressing.

The first thing to do is to provide ourselves with some sawdust, which we can get at the ice-house, lumber yard or perhaps at the carpenter's shop. Put it in a gunny sack and heat some water to soak it in. Let the water get hot, then put it in a tub or barrel and soak the sawdust, sack and all, for an hour or so, or until the water gets cool. Then lift the sack out and lay a couple of boards across the tub and let the sawdust rest on them so the water may drain back into the tub. While the sawdust drains, you might get a box ready to use for the germination box. It should be about four or five inches deep and not more than twenty inches wide, for in wider boxes, the center does not get sufficient air for strong germination. The length of the box may vary with the amount of corn to test at any one time. For every two inches in length, you can test ten ears of corn in a box twenty inches wide. Thus you see that a box twenty inches square is large enough to test one hundred ears. This is a convenient size to handle and it would probably be better to have several boxes of this size than to use the larger size. Take your sack of sawdust and tread the water out of it. This may be done by laying it on some boards and getting on and tramping it with the feet. After this is done, fill your box about half full of sawdust and pack it down solid. Level it off and press it down with a brick or a smaller box. The box should be half full after it is smoothed and packed down. Now take some best quality bleached muslin, the same size of your box and stretch on a smooth surface and tack the edge lightly. Rule it off into squares two inches each way. Begin at the upper left hand corner and number the squares from left to right, placing the figures inside the squares. Then place numbers eleven to twenty under the numbers one to ten, etc. Lay this cloth in the box on the sawdust and sprinkle some water on it. We are now ready to test our corn.

We will lay our corn we wish to test in rows and drive some nails after every tenth ear. Then we will get on the side of the row with the butts next to us, and number the first ear of every ten and if you wish, we can number every ear. What we want is to be able to find any ear without danger of a mistake. We will now begin with ear number one, and take six kernels from it as follows: One about two inches from the butt, one in the middle and one about two inches from the tip. The ear should be turned about one-sixth of the way round after removing each kernel. Now turn the ear and take three more kernels just opposite the ones just taken. This will give you kernels from all sides and both ends of the ear. Place these kernels in square number one of the germination box. Take kernels from ear number two and

place in square number two and so on until the box is filled. The kernels should be placed in each square, with the germ side up and the crowns of the kernels all pointing toward the top of the square. The best way is to lay them in two rows with three kernels in each row. We are now ready for the covering.

This cover should be of the same kind of cloth as the one under the corn and the same size. Spread this cloth carefully over the corn so as not to displace the kernels. By sprinkling water on this cloth, we can stick the two

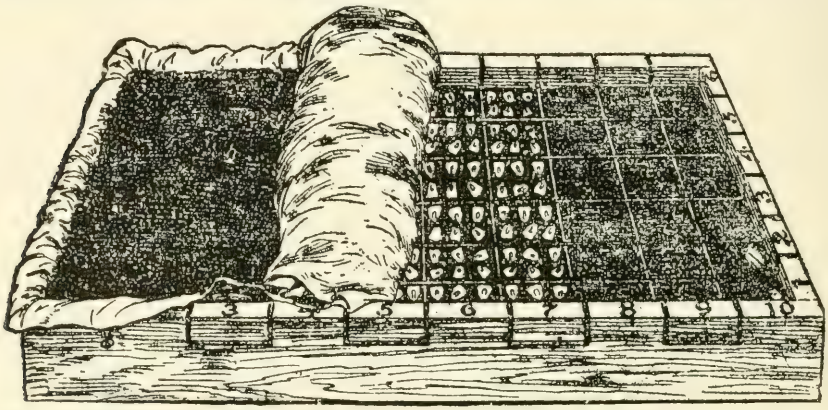


Fig. V. Showing method of constructing a germination box and the way the kernels are put in the squares. Also the way the sawdust on top of the corn is removed by rolling sawdust, cloth and all into a roll. The cloth recommended for covering the corn is not shown, but should be used so the kernels would not be displaced while removing the sawdust.

cloths together, which will hold the kernels in place. Now we will take a much larger cloth, say about twice as long each way as the box. We will spread it over the box in such a way that the box will be about in the center of the cloth. Then we will pour in enough of the damp sawdust to fill up the box and we should pack it down firmly with our hands. Be sure to pack the corners and edges good so as to hold the moisture. Then we will fold the edges of this cloth up over the sawdust on all sides. By doing it so, you see the sawdust is completely enveloped with cloth and will be easily removed. The box should now be placed in a warm place where the temperature is about the same as the living room, and does not get colder at night. The corn should be ready to take off in from four to six days. In our next lesson, we will take up the work of reading the test.

NOTE. A Germination Box should be made and some ears tested according to directions in this lesson.

LESSON XIV.

TESTING THE SEED—(READING THE RESULTS.)

If the test box has been kept in a warm place, the corn should be well sprouted in from four to six days. It will then be advisable for us to take our box out to where our corn is laid out and remove the sawdust. This is most easily done by beginning at one side and rolling the sawdust covering, cloth and

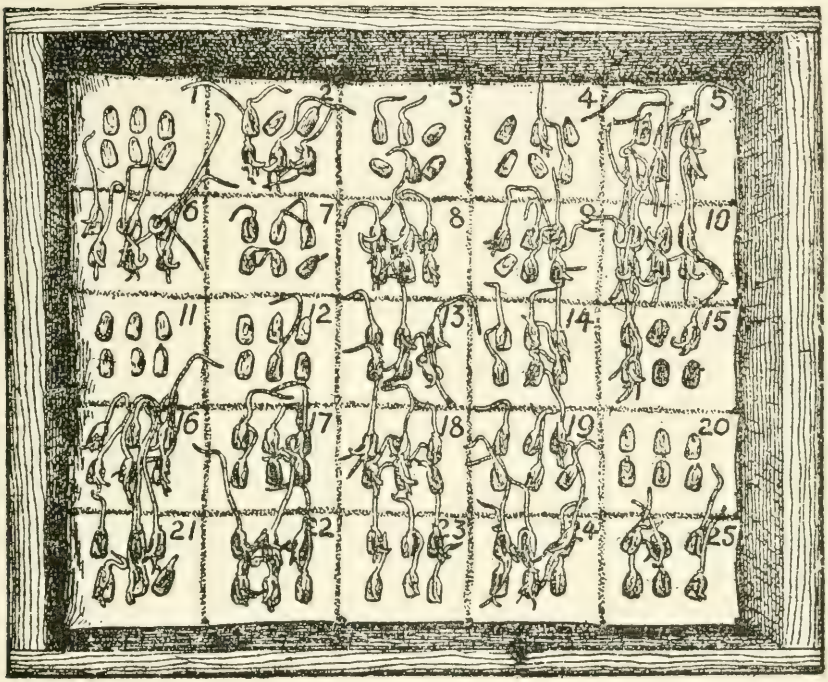


Fig. VI. Reading the results. 1, 11 and 20 are dead. 3, 4, 12, 15 should be discarded as three or more of the kernels have failed to sprout. 7 has sprouted but the kernels are weak. This should be discarded. 5, 6, 8, 10, 13, 14, 16, 17, 18, 19, 22, 23, 24, 25 are ears in which all kernels have sprouted. These should be kept for seed. 2, 9, 21 show ears where one or two kernels have failed to sprout.

all, up in a roll and lifting it from the box. With a little care and practice, this can be done without danger of displacing the kernels. We will now roll the cloth covering the kernels in the same manner we did the sawdust. We are now ready to read the test.

Take ear number one in your left hand and compare it with the kernels in

square number one. If our box has been kept under proper conditions our test will be reliable. Should the kernels from ear number one be all strong and vigorous, we will lay it out in one place, with all other ears that germinate strong and vigorous. In the same way, we will throw all ears in one pile that we do not wish to keep for seed. This pile will claim such ears as show very weak sprouts and those in which more than two kernels fail to sprout. The ears which show four and five strong sprouts should be kept in separate piles and, if used for seed, should be planted on the thinner ground or planted later in the season. If used on strong soil, the planting should be thicker. Of course, the strongest seed should be used in preference to the weaker, but in some seasons, enough of this quality can not always be had. By examining each ear in this way, with the kernels in the test box, we can separate the corn into grades and label the grades, but the best of all, we can determine with accuracy, the weak and worthless ears which would, if planted, cause a much greater loss than the expense of testing would be, for the testing can be done when our time is not so valuable, while if we plant bad seed and have to plant over, we not only lose the time when it is very valuable, but we often lose much more because the later planting does not produce so large a yield, and is also in danger of being caught by frost, which would result in soft, immature and chaffy corn. It is bad enough to be compelled to plant late on account of bad weather, or to plant over for reasons we cannot help, but to deliberately plant seed corn that we do not know absolutely will grow, and give a good stand, is to invite failure, which we should always avoid. I hope you will urge upon your folks at home the necessity of testing the seed and help to test at least a hundred ears and see what per cent is germinable. Should the test of a hundred ears reveal the fact that the seed was very good or very poor, finding it out early will give every one a chance to provide himself with good seed and thus avoid a great loss.

In conclusion then, I wish to impress upon your minds the necessity of testing the seed and thus avoid planting weak or dead seed. I also wish to fix in your minds, the methods of testing that is practicable for any one to use. Of course, if you use the cloths a second time, they should be boiled in order to kill the germs of mould that otherwise would develop. In next lesson, we will discuss the "Rag Doll" method of testing seed, which is similar to the sawdust box but does not take up so much room. It is not to be recommended above the sawdust box but is given simply to show how it is done and get those to test it this way that cannot procure the sawdust.

LESSON XV.

TESTING THE SEED.—(THE RAG DOLL METHOD.)

This method consists in getting strips of bleached muslin (best quality) about ten or twelve inches wide and as long as you wish and ruling off into squares, leaving a three-inch margin around the squares. This would leave room for two or three rows of squares. Number these squares similarly to the way you numbered the squares in the sawdust box. Take this strip of cloth and stretch out in front of your row of corn, with square number one opposite ear number one and so on. Take your kernels from ear one and place in square number one and so on until all the squares are filled. Take another strip of cloth the same size of the ruled cloth and place on top of the kernels and sprinkle water on it to stick the cloths together. Now begin at one end and roll it up in a roll and tie a string around each end and place the roll in warm water and let it soak several hours (not more than twelve). Then take it from the water and place where it will be kept moist and warm. Some pack the rolls between sawdust layers, others place in a pail and cover over to keep from drying out. The main point is to keep it from getting dry after the corn starts to germinate. While this method is all right, I much prefer the sawdust box as it does not require any attention after the box is packed, except to keep it from getting too cold. The Rag Doll method will appeal to some because it does not require sawdust nor necessitate the handling of any boxes when the corn is being tested. This, however, is not a difficult matter, when the smaller sized boxes are used.

LESSON XVI.

TESTING THE SEED.—(COMMERCIAL TESTERS.)

Commercial seed testers may be divided into three classes. The water tester, the soil tester and the blotter tester. In this lesson, we will simply take up those points that will enable us to get a correct test of our seed corn, should we use any of these testers.

The water test consists of placing the corn in trays with small compartments for the kernels from each ear. These compartments are so numbered that you can easily locate the kernels from any ear. After the kernels are all placed in the trays, they are placed in the tester, which is a box made of galvanized iron. The corn is then soaked in warm water for from twelve to twenty-four hours. After this, the water is drained off, and the box kept in a warm

place until the corn is sprouted. Some are kept warm by heat from a lamp, which is attached to the tester. Most of those who have tried this test, consider it too severe and say that a great deal of good corn will not stand this treatment. It is likely that the hard, flinty and mature corn would stand this test all right and that the softer grains would not. Should there be any doubt about the reliability of the test, a check test, by some other method should be made. When seed corn is scarce, we should not make a mistake and throw away any good seed.

The soil tester consists in testing the seed in the soil. The makers of this tester claim it is the best because the natural conditions are provided, while in all other testers, the conditions are claimed to be unnatural. It is probable that the kernel would sprout more naturally in the soil than in any other way, but the tester itself is heavier and more unhandy to handle than others. No doubt that the covering of the kernel rots much quicker in soil, thus enabling the sprout to break through it much more easily. This is considered one point in favor of the soil tester.

The blotter tester is probably the most practical of all the commercial testers. It is clean and easy to handle and can be used for testing all kinds of seeds. It is heated by a lamp and can be regulated so as to maintain any degree of heat desired. The seeds are laid in squares on the blotters and kept moist and warm throughout the test. No one who tests much seed could afford to be without one.

In the last few lessons, we have taken up the different methods of testing the seed corn. We need not buy a seed tester, in order to be able to test our corn. It is not so much a matter of what method we use, as it is important that we test our seed corn, each ear separately, and discard the poor ones. We should all be willing to do this much when it is such a simple and easy thing to do.

LESSON XVII.

GETTING THE SEED READY FOR THE PLANTER.

After testing the seed, and throwing out all the bad ears, we will take all our selected seed and lay it out in rows on a table made for the purpose, by placing some boards on a couple of barrels. We will then remove some kernels from each ear and place in front of them. We can now sort the ears into three grades, those that have large, medium, and small-sized grains. While we do this, we can also lay aside our best ears to use in planting the seed-patch. After sorting into grades, the butts and tips should be shelled off

and the mixed and damaged grains removed. We can now shell each grade separately, one ear at a time, with a sheller, catching the shelled corn in a shallow pan. This gives opportunity to discard an ear that we do not want, and which has escaped our detection up to this time, such as those with broken kernels or mouldy spots in them. When we have shelled each grade, the corn should be passed through a grader and all thick grains removed as these kernels often lodge in the planter plate, especially when an edge drop planter is used, and prevent the corn from passing through. A small hand grader will grade these thick grains out and should be used, as all corn that passes through the grader will go through the planter without lodging or breaking.

I have said that the mixed grains should be removed when we shell the butts and tips. This is true in the yellow varieties. The white varieties should be shelled and the mixed grains then removed, as we can not always find these grains in white corn before shelling.

We could go further and hand-sort the seed, removing all undesirable grains, such as badly shrunken or bad shaped grains. This step is very important in preparing the corn for the seed patch. Each grade of seed should now be tested in the planter and labeled with the plate number that plants the required number of grains at least ninety times out of one hundred.

LESSON XVIII.

TESTING THE PLANTER.

Now that the seed has been graded, we should get out the planter and raise it up off of the ground and place something under it to hold it in place. We can then operate the planter by turning the planter wheels. Of course, this would not be necessary in operating a hill drop as the check-rower does all the work of dropping in this kind of planter.

Suppose we take our grade of large kerneled corn and drop one hundred hills by using the large plates. All planters are furnished with three sizes, the large, medium and small plates. A record of the number of kernels dropped should be put down on a piece of paper. This can be done by simply putting down the figures in a row as follows: If the first drop is two, the second three, the third two, and the fourth four, the record would simply read 2-3-2-4. Now by dropping one hundred hills, we can ascertain just how many times it drops the required number. Say we wish to plant two grains to the hill and, on counting, we found our planter planted mostly three or four kernels, then we should change the plates for smaller ones. We

should keep on trying until we get the plate that drops the number we want, ninety or more times out of a hundred. By testing each grade in this way, we can soon find out if our plates are of the right size. If they are not, we can often get other plates that are. By doing this work early in the season, we will have time to order other plates before time to use them, should it be necessary. After testing the planter in this way, we will place the plates that drop the corn right in the sack, or else label the sack by tying on a tag with the number or letter of the plate that drops that grade the correct number of times.

If the corn is shelled early, it should be hung in a dry place and not too much put in a sack. Probably a half bushel to a bushel would not be too much. Put it out of reach of mice and rats and do not put in tight woven sacks.

While this work of grading the seed and testing the planter is an easy matter, too many farmers neglect it simply because they leave it until they get busy at other work and then think they do not have the time, when the truth is no one can afford not to take the time. No planter will drop corn evenly when the large and small kernels are all mixed together. The seed should be evenly distributed in the hills so the corn roots will cover all the ground and thus get the greatest amount of plant food. This will surely enable us to get the greatest possible yield. We cannot do this and have some hills with one stalk or none and others with five or six.

LESSON XIX.

PLANTING CORN, OPERATING THE PLANTER.

Corn is usually planted one of two ways. That is, it is either drilled or checked. While it is sometimes advisable to drill corn, say where the ground is free from weeds, or on fields of irregular shape, or on fields that are to be harvested by hogging down, it is much better to check it so as to permit of cultivation both ways. Checked corn also withstands the wind better, as the wind can blow between the rows in any direction. This is a great advantage in sections where strong winds are prevalent. Drilled corn, when blown down, is very difficult to husk, very much more so than checked corn.

While it is generally considered an easy task to check corn so it will be straight cross-wise, a great many farmers have not learned the philosophy of doing it. We will see if it is such a hard job as some people make of it. If the field is square or has one side and end at right angles to each other, the

work should be easy. In this case, always begin on the straight side and at the corner where the end is at right angles with the side. A fence at this end that is straight is a great help in setting the stake. When we start to plant, we should stake the wire about five feet outside of where the first row is to be. Drive across the field to the other end and turn around and make ready to plant. Attach the stake to the wire and draw it up tight and set the stake down tight back of the center of the planter. Place the wire in the check-rower and proceed to plant. As you approach the end (about four buttons from it), release the wire and turn around. Always set the stake at this end the same distance from the fence. By drawing the wire tight at the opposite end, the rows cross-wise, will be parallel to the fence and straight, provided the planter is properly adjusted and the horses are hitched so the planter boxes run level. New planters are always adjusted before leaving the factory, and generally check the corn all right, yet it is a good plan after planting about twenty rows to examine a row cross-wise. This should be done about twenty buttons from the end. As the hills will be about opposite the buttons, it is an easy matter to locate a hill in each of the rows planted, and a stake placed in the center of the hills. After setting the twenty stakes we can easily determine whether or not the planter is checking the corn straight, for, if it is, these stakes will be in a straight line. If, on investigation, the corn is found to be dropped too far back, the tongue should be raised, and, if dropped too far forward, it should be lowered. By running the planter boxes level and paying close attention to setting the stake at the straight end, the corn will be straight crosswise and the cultivation be made easy. In planting irregular shaped fields, the only way you can do is to draw the wire as tight as possible and set the stakes down deep so there will be no danger of them coming loose. Then, by driving as straight as possible, the rows will be straingt cross-wise and at right angles with your planter rows.

In planting corn, care should be taken to plant the proper depth. Corn planted early in the season, should not be planted deep unless it is very dry or cloddy. It should always be planted deep enough to get moisture but no deeper. When the ground is mellow, there is great danger of planting too deep. The best plan is to examine some of the hills and determine the exact depth and then adjust the planter accordingly. A little work with the lever will enable one to cover the corn in the furrows and low places. Do not expect the planter to plant the corn even in depth without you do your part. A splendid plan is to follow the planter with the cultivator, loosening the soil and covering the hills that are left exposed.

LESSON XX.

THE SEED PATCH.

When we were testing and grading our seed corn, we should have laid out all of our best ears and planted them by themselves. These best ears should be as near uniform as possible in every respect, but should be particularly so in breed type and in size and shape of kernel. The vitality should be particularly good. Do not be deceived into using any ear that does not have strong germinating power. Too many people make this great mistake. I would rather plant an ear that lacks a little in some ways but is strong in vitality, than to plant ever so fine an ear that is weak. Large yield and weak vitality never go together.

After we have selected our best ears, we will get them ready and plant them early. It would be better to plant it on fall plowed land that had been top-dressed with manure. By top-dressing, I mean that the manure had been spread on the land after it had been plowed and then disced in. The ground should be put in fine condition and the corn checked so it could be cultivated both ways and kept free from weeds. As soon as it is planted, it should be cultivated. Avoid cultivating in such a way as to cover the corn too deep. Always use the shields on your cultivator, which will avoid this danger.

While it is better to plant this seed patch by itself, yet it is not necessary. It could be planted in the regular field on the south or west side unless there would be danger of mixing with corn of different variety near it, in which case it may be planted on the north or east side. Of course, the field in which you plant your seed patch must be planted with the same variety of corn. It is a good plan to go through it and cut out the weak or barren stalks.

The great advantage in planting a seed patch, comes from the fact that when you pick your seed, you won't need to go over all the corn, but simply go through this seed patch where you have all of your best ears planted. You know that this corn is your best, because you planted the best here on your best ground, and have taken the best care of it. Besides you save a great deal of time in gathering your seed corn, which is no small item. Again, if a seed patch is planted, and well taken care of, we are more apt to pick our seed when it ought to be done. Many thousands of dollars could be added to the wealth of our farmers if every one would simply plant a seed patch with the best ears and then gather the seed from this patch and hang it at the proper time.

The corn crop is our greatest cereal crop, but it is not thought of or treated as such by a great many of our farmers. The time is fast approaching when

the man who neglects this important step in growing corn, will be compelled to go out of the business, because he cannot make a living. The rise in the price of land and rent, will demand better farming in the future, so let us be prepared to meet this responsibility. One of the best ways to do this is to plant a seed patch and gather our seed at the proper time and take proper care of it.

LESSON XXI.

PREPARING THE SEED BED.

The preparation of the seed bed for corn should not differ much from the preparation of soil in the garden. The nearer we approach garden conditions, the better the corn will be likely to grow. No pains should be spared to put the seed bed in the best possible condition because large yields can not be obtained in any other way. Deep plowing in the fall or early spring should be provided when possible. Frequent discings should put the soil in good condition for planting. No soil should be plowed or worked when wet, because soil worked wet is put out of condition. That is, the plant food is rendered unavailable and the corn plant suffers from want of plant food, in the same way that an animal would suffer by being near feed but unable to reach it. Good drainage, both surface and under-drainage, should always be provided so as to quickly remove the surplus water.

It is not the purpose of this lesson to give detailed information on how to prepare a seed bed for corn in the different kinds of soil, but to emphasize the necessity of preparing the seed bed well. The old saying, "Well begun is half done," might well be changed in this case to read, "Corn planted on a well prepared seed bed is half raised," and the truth of the assertion could not reasonably be questioned.

We learned, in a previous lesson, the conditions of germination were moisture, heat and oxygen. These conditions are best provided by having the seed bed in a firm, fine condition. The seed will germinate quickly in this kind of soil, provided the heat is present. The planter puts the corn in the ground and the wheels press the dirt firmly about it so the corn takes up the moisture and germinates readily unless the soil is poorly prepared, in which case the corn often fails to sprout, or sprouts unevenly. Some of it often lays until a rain comes before it germinates at all. This never occurs when the seed bed is properly prepared.

A good seed bed cannot be had on cloddy ground. To avoid this is easy when the ground has been plowed in fall or early spring. Spring plowing

should be immediately pulverized to avoid clod formation. A good plan on stalk ground is to disc well before plowing. The stalks should not be removed but cut up well and plowed under to furnish humus in the soil. Humus is decaying vegetable matter and keeps the soil loose and mellow. Soil which is full of humus does not wash badly nor does it run together and become compact after heavy rains. It is easy to prepare a good seed bed in this kind of soil. It is also easy to keep it in good tilth or condition throughout the growing season, because it does not bake and crack open like the thinner soils.

If we keep in mind what a good seed bed is, and learn how to prepare it, a big step in advance will be made in the growing of corn. Too many farmers try to farm more corn than they can tend well. This means that too little work will be done in preparing the soil. It is safe to say that the crop yield could be materially increased if, instead of trying to farm a large acreage, each farmer would only plant in corn what he could take good care of, and put the rest of his land in some other crop. He would then raise more bushels per acre on what he had in corn, and no doubt would raise better crops of something else on the rest of his land, because he would have the time to put on them. The smaller acreage and the frequent changing of the fields planted to corn, will be the greatest factors in increasing the yield per acre of our corn crop. There is no doubt but what we should be raising forty or fifty instead of thirty bushels per acre. Many farmers do even better than this. Let us all strive to increase the acreage yield to at least forty bushels per acre and by so doing, increase the value of the crop many million dollars.

LESSON XXII.

THE CULTIVATION AND CARE OF THE CROP.

In preparing the seed bed we should have had but one thought in mind and that was to get the soil in a firm, fine condition. Cultivation should begin as soon as the corn is planted. We should know something about why we cultivate and also know the methods best adapted to our purpose. A seed bed, properly prepared, is not in the best condition to hold moisture because it is too compact. This condition, while it is just right for the germination of the corn, is too compact to let stand any length of time as it is very apt to bake and crack open, if it is not stirred right away. For this reason, the corn should be cultivated, if possible, as soon as it is planted. The planter marks will thus be obliterated and furrows between the rows will allow the

water to settle there instead of in the rows, should a heavy rain follow planting. This cultivating after the planter is called blind plowing, probably because we cannot see the corn. We should always use the shields so the corn will not be covered too deep. By cultivating in this manner, the surface is left rough and after a few days, the weed seeds germinate and can be easily killed by harrowing the ground crosswise. This should always be done before the corn comes up. If we cannot do this on account of rain or otherwise, it is best to wait until the corn comes up and then cultivate crosswise. The harrowing is the best if it can be done because it kills the weeds in the hills.

The first cultivations should be of good depth on soils that are inclined to be heavy, while on sandy soils, it is necessary to use a method that will tend to compact the soil and surface or shallow cultivation is best. We cultivate for three reasons: To conserve moisture, to kill weeds, and to render plant food available, consequently, we should cultivate frequently. The corn should root below the depth we cultivate so we will not injure the roots of the corn when cultivating. If the top three or four inches of soil is kept loose, the corn will not root here because it is necessary for the roots to come in close contact with the soil before they will fasten themselves to it. For this reason, the top soil should be stirred often. These frequent cultivations will enable us to keep ahead of the weeds and is absolutely necessary in conserving the moisture in dry seasons.

A common mistake made by many is to let the ground lay too long between cultivations, which gives the soil opportunity to settle close about the corn, and roots are sent out in the surface soil and are, of course, injured by the next cultivation. The surface soil should be kept loose at all times to avoid this. Let us see, if we can, why it is that a loose surface soil is so necessary in conserving moisture, especially in a dry season. You all have noticed how the oil in a lamp wick feeds the flame. If you were to cut the wick into two pieces and then join them together with a piece of wire, the lamp would burn only as long as the oil lasted in the upper part of the wick because the wire is not a conductor of oil. This rise of the oil in the lamp wick is called capillary action, and it is in this way that water rises in the soil. Now in order to keep the water from coming to the surface and escaping, we must place an obstruction a little way below the surface, which will prevent it in the same way the wire in the lamp wick prevented the oil rising to the flame. We do this by keeping the surface soil loose and when the water rises to this point, it cannot come any further and we thus conserve it. We can further illustrate this by laying a board, some heavy tar paper, or even some coarse straw on the ground. In a very short time, if you lift these up, you will find the soil is moist under them. They have kept the

moisture from evaporating into the air in the same way that the loose surface soil or soil mulch does. Compact soil would simply enable the moisture to escape. You have probably noticed the planter tracks, in the early morning, were damp, while the soil right by them was dry. They are damp for the reason that the soil is compact and the moisture can rise to the surface without any hindrance. In fact the wheels are made for the purpose of compacting the soil over the seed so it will germinate readily.

We can now understand some of the reasons why we cultivate and should be able to know when and how often it should be done. We should get away from the notion that we should cultivate a certain number of times or that we should get our corn all laid by before the "Fourth." We should cultivate as often, and as late in the season, as the corn needs it, regardless of how many times that is, but generally, cultivation should cease as soon as the corn gets large enough to shade the ground. Should the soil become compact after a heavy rain, later cultivations are sometimes beneficial but unless something like this happens, the later cultivations are not advisable as they are apt to prolong the growth of the corn and keep it from maturing.

A word or two about the kind of cultivator to use. Some are partial to one kind and some to another. On well prepared soil, which is kept clean, the smaller shovels are best, while the larger shovels are best in weedy and poorly prepared soil. Shovel cultivators are best for use in heavy soils, while the surface type are best in the loose soils. It is not so much a matter of what kind of plow we use as it is that we do the work well, and do it when it should be done. If we keep this idea in mind, it will not be hard for us to decide on what kind of a plow to use.

LESSON XXIII.

MARKETING THE CROP.

We market our crop either by selling it or by feeding it to live-stock. Of the two methods, feeding it to live-stock is much the better, because we keep most of the fertility on the farm. The best plan is to put the corn into the silo, which is a tall, round, air-tight building, which preserves the corn in much the same way we preserve our fruit by canning. The advantage of the silo lies in the fact that we save the corn stalks as well as the grain. By feeding the ensilage and returning the manure to the soil, we do not impoverish it so fast as we would by selling the grain and burning the stalks, besides the feeding value is much greater when put in the silo than in any other method be-

cause it is more palatable. Many of our best farmers have two silos; one for summer, and one for winter feeding.

When corn is to be cribbed, care must be taken not to put it in cribs too green. Corn should be almost dry enough to shell before cribbing and the cribs should be narrow. Wide cribs should have ventilators through the center so as to prevent the corn from heating. Slatted cribs are much safer than tight ones and should be provided if possible for at least the early husked corn.

Corn, to have the highest value, either for sale or feed, must be dry and sound and should be cribbed so it will keep in good condition till the following season at least. No corn should be sold from the field that can be kept over as the market is never so good at this season of the year as it is later.

Immature corn, that is unsafe to crib, may be sold to good advantage in the winter. It is usually sent to the starch factories, which is probably the best thing to do with it unless we can arrange to feed it out before warm weather comes.

Stalks left in the field should be pastured closely and disced down and plowed under the following spring. They should never be pastured when the ground is muddy but when it is either dry or frozen. If the corn is cut, the ground should be put into winter wheat or rye for a cover crop to catch the winter snows. Ground should not be left exposed to the sun and wind unless it is plowed and the surface left rough. If the corn is cut either for the silo or for fodder, it should be done when the corn is well dented. This will be about the time that the husks are brown and the blades below the ear are dry. The plant at this time has the greatest amount of nourishment in it and should be cut as soon as possible when it reaches this point, for it usually gets past this stage in about a week.

The best way to harvest and market the corn crop is to feed it to a good quality of live stock, such as draft colts, hogs, beef cattle or lambs and return the manure to the soil. Under this plan, by rotating the crops and applying some fertilizing material, such as Rock Phosphate, the soil may be kept in a high state of fertility, and the most made out of the crop. We should avoid taking away from the soil and returning nothing, as sooner or later, our land will cease to grow profitable crops. We can avoid this by marketing our crops by feeding live stock instead of selling the grain from the farm.

LESSON XXIV.

INSECTS INJURIOUS TO CORN.—(THE CUT-WORM.)

Like a great many people, the corn plant also has a great many enemies. Among these enemies, the insects are among the worst. If we understand something about the life history of these insects, we will be better able to combat them. Some are easy to fight, while others are very difficult. The cut-worm is one of the easiest to combat, if we understand how they propagate their species.

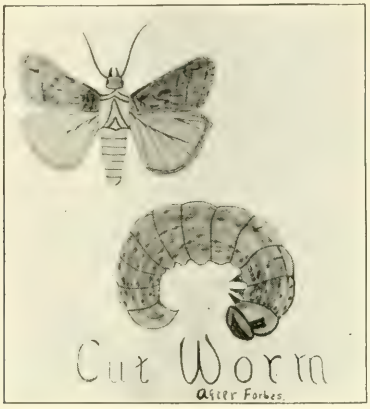


Fig. VII. Showing the larva and adult of the cut worm. The upper picture is the moth that lays the eggs, and the lower the larva or worm that does the damage.

The cut worm is the larva of a moth which flies at night. You have probably seen many of them hovering about the light on hot nights. They are of a dusky brown color and have thick bodies. These moths, or candle flies as they are often called, appear in early summer and lay their eggs in grass lands and along fence rows. In a few days the eggs hatch into little brown worms which burrow into the ground living on the tender grass until winter, when they become dormant. They remain in this state until warm weather comes, when they continue feeding on the tender grass until along in May when they burrow an inch or so underground and construct earthen cells about them. These earthen cells are sometimes called cocoons, which are nothing more nor less than a little house or nest. While inside this cocoon the larvae undergo a change and in a short time emerge as full-grown moths. They are now said to be in the adult form. These moths wander about seeking well protected grassy places where they may deposit their eggs.

This they find in the thick grassy lands that have been in grass for some time. As soon as the eggs are deposited, the female dies, its life-work being ended.

While inside their cocoons, the cut worms are called pupae, and they are said to pupate while in here, which means that they simply transform or change from the larva or worm form into the adult form. All insects undergo a similar transformation. Insects of this kind feed voraciously while in the larva form, but never after they pupate. The cut worms feed more ravenously in spring after their winter sleep, which accounts for so much damage being done on sod lands which are broke up and put into corn. Especially will this be the case if the sod is plowed in spring, because the larva have attained sufficient size that they are not easily destroyed while the ground is being prepared.

By knowing the life history, we are able to successfully combat the cut-worm. Fall plowing is very effective, because the larvae are turned up and exposed to the cold weather, which kills them. Sod plowed in the spring is either planted quite early or left until quite late in the season. As all fields are not always infested, it is probably best to plant early, so if the cut-worms do take it, there is time to plant it over before it is too late. If the corn is planted about the time the cut-worms are undergoing their change, there will be no danger from damage.

There are said to be thirteen different kinds of cut-worms but we are most familiar with only two kinds. One is the small brown cut-worm, which devours the whole plant, and the larger brown one which simply cuts the plant off just under the ground and then goes to a new plant to repeat the performance. You will probably be most familiar with the last named, as he is found in the garden, and is not particular on what kind of plant he works. The cut-worm can be poisoned by soaking bran in a solution of arsenic and sowing over the surface of the ground. As I told you, they feed only in the larva form and, if this is done about the time the ground is planted, the worms, being hungry, are easily poisoned. This is only practical on small fields. The best plan is to always fall plow the sod land or, if this cannot be done, plant the corn as late in the season as possible or about the time the worms are undergoing their change.

LESSON XXV.

INSECTS INJURIOUS TO CORN.—(THE WIRE-WORM.)

The wire worm is the larva of the click beetle which lays its eggs in

flat, soggy ground. Its natural home is in grass land hence the great damage done by the wire worms to corn on sod lands. The natural food supply being cut off the young larvae become ravenously hungry and go to work on the available food present and the corn being there in limited quantities, they usually make a clean sweep. Unlike the cut-worm, the wire-worm is very fond of the sprouted kernel. The process of germination has rendered the kernel soft and the starch has changed to sugar, which furnishes a very appetizing dish to the hungry larvae. Should they be delayed in finishing the hills of corn until after it has sprouted, and growing nicely, they do not become discouraged and leave, but go to work on the young sprouts. They usually enter the kernel and bore up through the heart of the stalk and they rarely fail in destroying the plant before they leave it.

Fig. VIII. The larva and adult of wire worm. Upper picture the click beetle that lays the eggs and the lower the larva or worm that does the damage.

The wire-worm is very difficult to combat because it takes from two to three years for them to attain full size. This accounts for them being quite as bad, if not worse, on second sod as they are on the first crop. It may be that they have sufficient food in the young grass turned under that they do not bother the corn so bad on first crop as they do the second year. This would account for the apparent absence of them on first crop sod and their being so bad the following year.

I wonder how many are familiar with the wire-worm? Strange to say, you would hardly recognize the young as being related to the click beetle. This beetle is a small, black fellow, not more than one-fourth of an inch long. He looks like he was made of two parts jointed together near the middle. His head is under the front of the first part or segment, where he can see the ground in front of where he wishes to go. He is easily recognized from other

beetles because he makes a clicking noise as he moves about. Perhaps, if you look closely, you might catch one of these little fellows and see just how he makes this clicking sound. See if he does it with his mouth or his legs or otherwise.

I told you before they lay their eggs in grass lands and the young larvae or worms immediately burrow into the ground and go to feeding on the grass roots. If you were to compare the larva of the wire worm with that of a cut worm, you would find them very much different. You would find the wire worm to be made up of joints or segments, and they seem to have a hard shell or coat over them. Suppose you find some of them and count the joints and see how many they have. See if you can find their mouths. Notice how pointed they are and how easy they bore into the ground when you disturb them. Well, they seem to be able to bore into a kernel or stalk of corn just as easily.

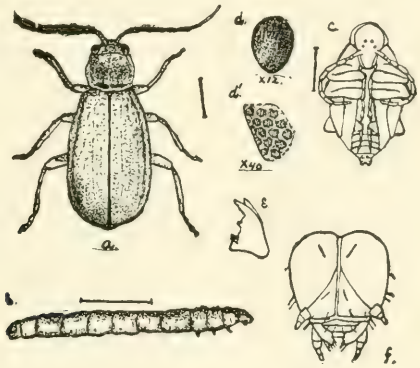


Fig. X. Corn root worm. a, beetle. B, larva. C, pupa. d, egg. d', egg magnified. f, front view of head.

Now as I told you about the cut worm, the wire worms eat only while in the larva form, but unlike the cut worm, it takes three years or nearly so for them to get large enough for their transformation to the adult form. When they reach this stage they burrow into the ground and spin a cocoon about them and undergo their change which does not take so very long. They then emerge from the cocoon as the adult form, or the click beetle. In a little while, the female lays its eggs and in a short time thereafter dies, its life work being ended.

We have learned something of the life work of the wire worm and should be able to see that it is a very hard matter to get rid of them. In fact, it is almost useless to try to raise corn on land that is badly infested. For this reason, it would be better to plant something else. If the corn has been

planted and a good stand secured, except in spots where the wire worms are bad, it would probably be best to plant pumpkins or turnips or rape on these spots. The pumpkins could be planted in hills early, and the turnips and rape be sown at the last cultivation.

Good drainage and clean cultivation should be supplied and short rotations be practiced on land badly infested with wire worms. This will tend to starve them out and the beetles will be driven to other fields as they do not seem to thrive in well drained soil nor on land where the crops vary. The great damage done to the corn crop by wire worms could be largely avoided if the land was not left in grass crops but a year or two at a time.

LESSON XXVI.

INSECTS INJURIOUS TO CORN.—(THE CORN ROOT WORM.)

The corn root worm is the larva of a small, soft, pale green beetle, which is about the size of the striped cucumber beetle, or a trifle larger. There are

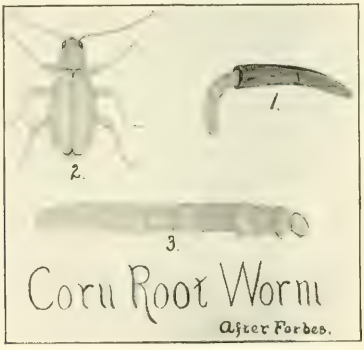


Fig. IX. Showing larva and adult of the corn root worm. 1, shows larva or worm at work in the corn root. 2, shows the adult or beetle that lays the eggs. 3, shows larva or corn root worm. See Fig. X.

two kinds, the northern and the southern variety, but the northern variety is the most prevalent. They are easily distinguished from each other as the southern variety have black spots on them, while the other kind have none. They lay their eggs at the base of the corn stalk and the small larvae hatch out the following spring and immediately disappear into the ground where they feed on the tender roots of the corn. They bore into the roots similarly to the wire worm, but in turning, the roots are invariably cut off. This ac-

counts for the fact that fields badly infested with the corn root worm falls down badly late in the season. Many fields are damaged to the extent of half or even more. The beetles appear late in July and are present until they lay their eggs, when they die.

As the corn root worm is distinctly a corn pest, they are easy to combat by changing the crops so as to avoid having corn on the same ground more than two years in succession. This pest is probably a blessing in disguise as it compels us to rotate our crops, and not grow corn so extensively. As the beetles lay their eggs only in cornfields, they are easily starved out. We should suffer no loss from these fellows.

If you will go into a field along in July or August, which has been in corn a couple of years previous, you would see many of these little soft shell beetles. They are about the color of the corn and are on the go most of the time. Now if you were to pull up a hill of corn a little later in the season, you would be surprised how easy you could do it. The reason is that a great many of the roots have been cut off. On close examination you would find many of the larvae or corn root worms. They look like little maggots about the size of a pin and are present in large numbers. You would not suspect that these little worms were the young of those little green beetles, but they are and are responsible for a large loss in many of our cornfields. The corn is not only poorer but it blows down so easily that a great deal of it is spoiled and becomes chaffy before it is husked. We can avoid all this loss by rotating the crops and thus starving them.

LESSON XXVII.

INSECTS INJURIOUS TO CORN.—(THE CORN ROOT LOUSE.)

The corn root louse differs from the insects we have studied mainly because they are almost wholly dependent upon the common brown ants for subsistence, while in return for this care, the lice secrete a fluid called honey dew, upon which the ants live. For this reason, the lice are called ant cows.

A close study of the ant reveals some marvelous things with respect to the intelligence of insects. The ants belong to the order of insects called Hymenoptera, which also includes the bees and wasps. This order of insects live in colonies and in many respects show great intelligence. They divide their work among themselves, and in each division the individuals are peculiarly fitted for the work they are required to do. For instance, one band of ants are soldiers and are fitted with large jaws which enable them to fight their enemies to the best advantage. The worker ants are imperfect females; that

is, they do not lay eggs. Their work is to provide food for the colony and take care of the ant cows. The scientists tell us that the difference between these imperfect and the perfect females is brought about by a system of feeding. The perfect females are fed so they fully and completely develop, while the imperfect females, or worker ants, are fed more lightly and do not fully develop.

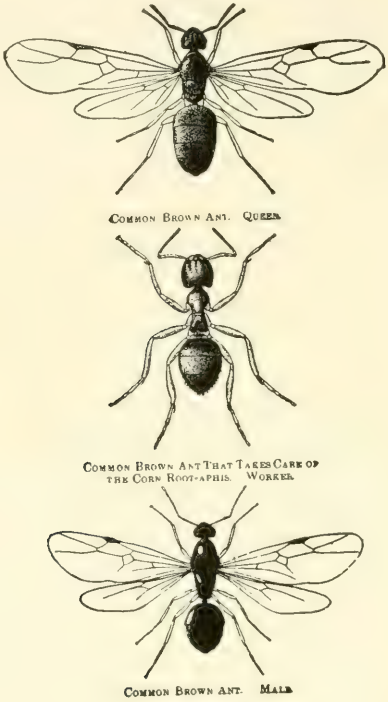
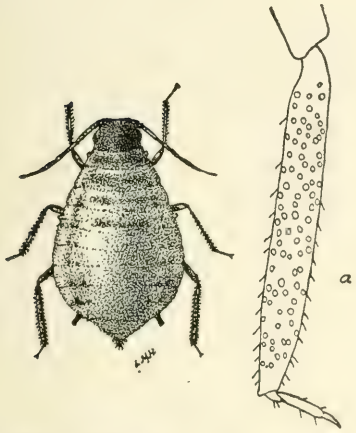


Fig. XI. The Brown Ant.

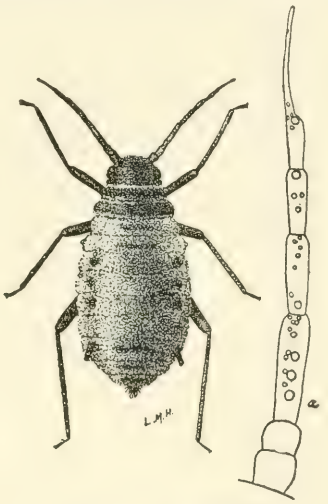
I have given you this information regarding the ant that you may understand more about the corn root louse. As I told you, the ants live in colonies and they are constantly on the lookout for herds of ant cows or plant lice, as we call them. When they locate a drove, they capture and carry them bodily to the plants they wish them to feed upon. The small, brown ants take their captives and place them to pasture on the corn roots. The lice stay there and suck the juice from the roots and are guarded jealously by their captors until the roots are all thoroughly sapped, when they remove them to new pastures. The soldier ants guard the lice and will fight the enemies furiously in case the lice are attacked.

The natural enemy of the plant louse is a small, yellow fly. The ant knows these little fellows and will attack them as soon as they see them. In a collection of live insects, one of these flies and an ant was placed. On opening the bottle, half an hour later, the ant had seized the fly by the throat and killed it. Some would have thought that the ant was simply making a meal of the fly, but the truth was that the ant recognized the enemy of the lice and instinct taught him to exterminate all enemies on sight.

We have seen how diligent the ants are in caring for the lice. They are equally dilligent in feeding themselves upon the honey dew secreted by the

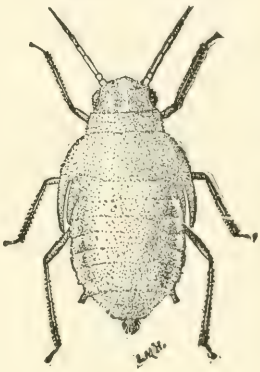


Oviparous Female (*a*, Leg of Same).



Male (*a*, Antenna).

Corn Root-Louse: Viviparous Female and Extremity of Abdomen.



Pupa.

Fig. XII. Different forms of the corn root louse.

lice. If you were to watch closely, you could see how the ants do their milking, as it is sometimes called. When an ant becomes hungry, it simply approaches one of the ant cows and prods it with its antennae, or horns. The louse immediately secretes a drop of honey dew from small projections on the side of the body, when the ant proceeds to take his meal. This he does with evident satisfaction. Thus you see that while the lice are largely dependent on the ants for their food supply and protection, the ants are well repaid for their work by the food furnished them by the lice.

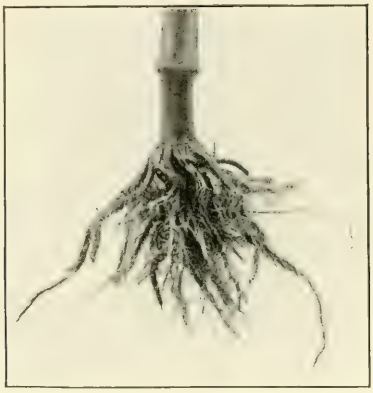


Fig. XIV. Showing root of corn damaged by corn root worm. This stalk of corn could be lifted from the ground with very little effort.

Another variety of ants pasture their ant cows on the leaves of trees and in some cases, on wheat and corn. The green bug of the south was simply one family of these plant lice. Perhaps if some of you would take the trouble to look about, you might find a colony of plant lice on a tree or corn plant. If you find an ant den, you may be sure the lice are near by.

The presence of the ants in the cornfield in large numbers is sufficient evidence that the field is infested with the corn root lice, but you will also notice that the corn does not grow thriftily but has a weak, sickly appearance. Some plants will be affected worse than others, which causes the crop to lack uniformity in size and color. Short rotations in which corn is not grown on the same land more than two years in succession will generally reduce the damage from these pests to the minimum, as the ants will have to move their herds to new fields so often that great numbers of both the ants and lice perish for want of food and from their enemies.

You probably would like to know what these root lice look like. Well, they are about the size of a pin head and are oval in shape.

They are called sucking insects because they suck their food from the plants on which they live. They are not readily recognized as insects unless a close inspection is made, because their color is usually very similar to the plants on which they are working. Perhaps you can find some of these insects and see for yourself what they look like. If you will pull up a stalk of corn where the ants have a den at the roots, you will find the roots covered with these corn root lice. You may have to look closely but you will surely find them. If a magnifying glass be used, you could learn more about their shape and size than you otherwise could, as they are pretty small to see with the naked eye.

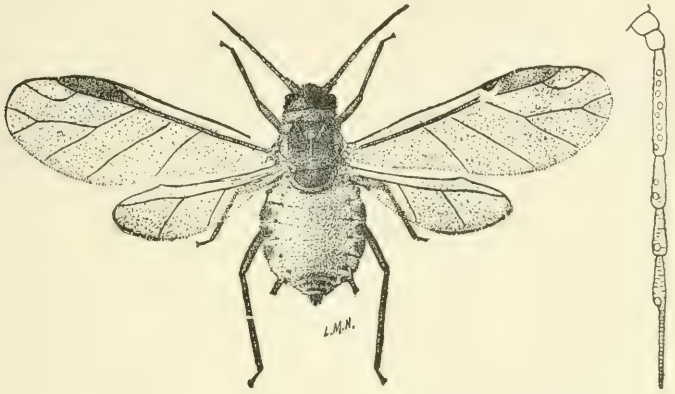


Fig. XIII. Corn root louse, winged female (viviparous).

The plant lice lay their eggs and the young lice grow similarly to the larvae of other insects, except that they look, in the larva stage, much like they do in the adult form. They sometimes develop wings but most often they remain wingless. On young trees, they may be killed by spraying with kerosene emulsion. You might remember that all sucking insects are killed by contact while biting insects have to be poisoned by spraying with Paris green or some other poison. Potato bugs belong to this last class of insects.

LESSON XXVIII.

INSECTS INJURIOUS TO CORN.—(MISCELLANEOUS INSECTS.)

The common grub worm is the larva of the May Beetle or June bug. You have probably seen them flying around the light at night. They make a loud, buzzing noise and often fly against the face with such force as to

cause considerable pain. These beetles lay their eggs mostly in blue grass and the larvae feed upon the roots. The grass is often killed by these grubs. Like the wire worm, it takes from two to three years for them to become full grown. They usually change to the beetle form along in the fall before they

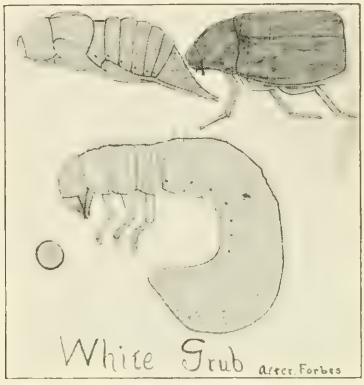


Fig. XV. Common grub worm. The beetle is shown at upper right-hand corner, the pupa at the left of it while the larva or grub worm is shown in lower picture.

appear as mature insects. They do most of their damage in blue grass sod that has been plowed up for corn. If the sod has been plowed in the fall, many of these grubs will be destroyed. If spring plowed, the ground should be worked frequently to give the birds a chance to prey on them. In hog pastures, if the animals are not rung, they usually get rid of the worms.

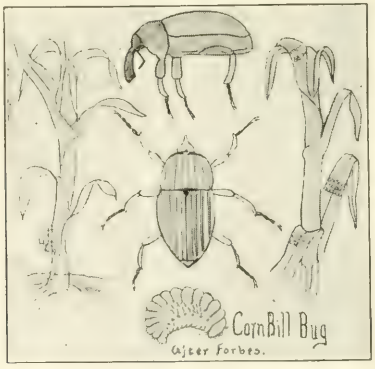


Fig. XVI. Corn Bill Bug.

Along in early spring, the pastures rooted up should be sowed to small grain and grass seed and then harrowed. The hogs should be rung and kept off the field until this grass and small grain is well started. Pastures treated in this way are thus revived and the yield of grass greatly increased.

Fig. XVII. Corn stalk borer. Moth is shown in upper left-hand corner, Pupa at the right of moth or adult; Larva at the bottom. Other cut shows worm at work inside the stalk.

The corn hill grub looks very much like the corn root worm only it is larger and has a dark-colored head. They do not trouble the corn crop to a great extent, and the handling of the crop so as to avoid damage by other insects, is also effective in combating these worms.

The corn web worm is very similar to the small cut worm except that it spins a web about it. It sometimes appears in great numbers but is usually kept in check by its enemies. The same handling of the crop that is used for the cut worm is also effective against the web worm.

The corn bill bug is a small beetle which has a long proboscis or snout. It punctures the corn near the surface of the ground and sucks its food from the plant similarly to the way the root louse does. Later, when the leaves unfold, they are full of small holes. While these bill bugs, no doubt do some damage, to the growing corn, this damage is never very great. They are also kept pretty well in check by their enemies.

Other enemies which often damage the growing corn are the chinch bugs, grasshopper, and the corn stalk borer. In some sections, these are quite bad and are very hard to combat. The damage, however, is usually confined to

the borders of the fields as these insects usually breed along the fence rows and in the meadows. Short rotations are the best method of fighting them.

We have made a pretty close study of the principal insects which are injurious to the growing corn. I hope all of you will make it a point to observe closely and see if you can find any of them. When you learn to know these

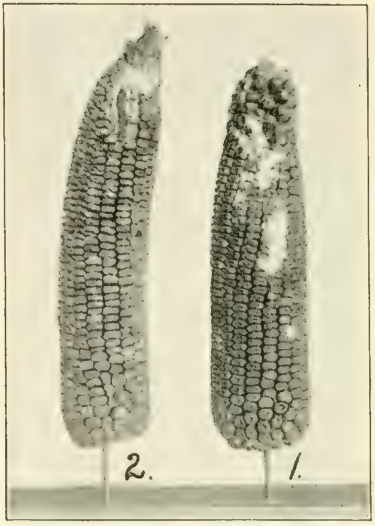


Fig. XVIII. Shows corn ear worm. Left-hand ear shows worm at work, right-hand picture shows ear damaged by worm.

different kinds of insects on sight, it will help you in the management of the crops so as to avoid loss from them to a great extent. This is the main purpose we should have in view when studying them. In next lesson, we will study those insects that damage the grain.

LESSON XXIX.

INSECTS INJURIOUS TO THE EAR.

The corn ear worm belongs to the same family of insects as the cotton boll worm of the South. This is why it is sometimes called the corn boll worm. We usually speak of it as the corn ear worm. They vary in color

from a light to a dark green, and are sometimes spotted in color. They are the larvae of a moth, which lays its eggs on the growing corn. There are four or five generations of these each year. The young worms live on the grain of the corn and sometimes burrow down next to the cob and along between the rows. They do not seem to be able to work on the corn after it gets well dented, so early planting usually escapes much damage from these pests. The late corn is usually damaged to quite an extent by these worms. They not only destroy the corn but they also render much of it unpalatable for feed. Corn badly eaten by these worms also spoils to a great extent. These worms seem to be getting more numerous.

The corn moth does not do much damage except where corn is kept in storage, year after year. They lay their eggs on the ear where they hatch and the larvae at once enter the kernel and feed until they transform into the adult form. This happens along in early summer. The ears will look as if the grains had been punctured by a sharp needle. These insects do not do much damage to corn in the crib but are usually more to be feared in the seed storage worm. It is an easy matter to kill them, both in the larva and adult form, by placing the corn in a tight box or chest where some moth balls have been placed.

The corn weevil does some damage to corn but its damage is confined to the warmer climates. They usually devour the greater part of the grain in a similar manner that the young of the corn moth do. The weevil is the larva of a beetle and is about the size of the larva of the corn moth or about one-fourth of an inch long. No doubt they could be eradicated by placing the corn in tight bins and treating with carbon bi-sulphide in the same way that a house is fumigated.

LESSON XXX.

OTHER ENEMIES.

We have studied, up to this time, insect enemies of corn. There are other enemies besides these waiting to exact their share of the crop. Crows often pull up the corn when quite young, the mice dig up a hill now and then, and the squirrels claim, in some cases, many hills. Pocket gophers and moles do some damage. While these varmints are more or less to be feared, the loss can be reduced to the minimum by poisoning. Pocket gophers may be poisoned by dropping some raisins, which contain a grain of strychnine, into the runs. A hole may be made between the mounds with a planter stake or

a sharp stick and the raisins dropped in. The gophers attracted by the light coming through the opening, immediately appear and get the poisoned food. Squirrels and mice may be poisoned by soaking some sprouted corn in an arsenical solution and sowing along the grassy borders of the corn field. This plan is objectionable because some birds are apt to be poisoned, but this usually does not occur to any great extent when the corn has been sprouted, as only the largest kinds are likely to eat it. Some people sprout the corn and sow it without poisoning; others sow the dry corn and thus feed the squirrels and mice until the planted corn comes up and gets large enough to be out of danger.

Moles should not be poisoned as they usually appear where insects, such as wire worms, are plentiful in the ground. This being their source of food supply, it is claimed that they do not eat corn. If this is true, they would not eat poisoned corn and this could be used to kill the mice that follow the runs and destroy the corn.

We have taken up, so far in this lesson, only those enemies of the corn crop which belong to the animal kingdom, and have said nothing of the plant enemies. Weeds of all kinds are out of place in a corn field and should be considered as enemies. Of these weeds, fox-tail is the most common. All weeds are worse in wet than in dry seasons, because we are kept from cultivating frequently, which is the only way to keep weeds in check. Weeds are easily killed just as they first appear through the ground, because the roots have not as yet attached themselves to the soil. At this stage, they are said to be in the white, because the roots when turned up are white and tender and very easily killed. If the soil is stirred frequently, the weeds are kept from rooting. This should be kept up until the corn shades the ground, and the deep rooted weeds all pulled. If this is done, the loss from weed enemies will be reduced to the minimum.

Such weeds as Morning Glory, Marsh Smartweed (Devil's Shoestring), Milkweed, Quack Grass and Canada Thistle are hard to eradicate because they grow from underground roots as well as from seed. Careless cultivation often times scatters such weeds because any parts of the roots will grow, if left covered by a little soil. The only way to kill them is to keep any leaves from forming for a season or two and thus smother them, for plants will not grow very long unless the leaves are allowed to form. Annual weeds, or those that come up and make seed each year, such as Rag-weed, Cockle Burr, Smart-weed, Foxtail and Butter Print, should be pulled before they go to seed. Burdock and Sourdock should never be left to form seed as one plant produces so much seed that a field soon becomes badly infested.

How many of you are familiar with the different kinds of weeds? Do

you know what the seed of a rag weed or a cockleburr looks like? Suppose you find out when the time comes for them to make seed. You will find that the seeds vary in size and shape fully as much as the plants do. It is very important that we learn to recognize bad weed seeds, especially when we buy seed of timothy or clover to seed our land. We should never sow seed that has such seeds as Buck-horn, Dodder or Canada Thistle mixed with it.

There is one enemy to the corn crop that we can, if we will, avoid and that is the poor care of the crop. We should never try to raise corn on a poorly prepared seed bed or by planting and then neglecting the crop. We should know that we cannot grow two crops at the same time on the same ground so we should keep the weeds down. If we put the crop in well, and then take good care of it, we have the satisfaction of knowing that we have done the best we can to insure a crop and if the season is not favorable, we cannot help it. The weather is something over which we have no control, yet we can, in a large measure, counteract the effects of an adverse season, by thorough preparation of the soil and by frequent cultivations afterward. It should be the aim of every corn-grower to do his best at all times and then trust to Providence to send him favorable weather. Surely the thought of work well done will be a great consolation to him who does it.

LESSON XXXI.

ROTATION OF CROPS.—(SMALL GRAIN.)

In order to grow the largest crops of corn, it is necessary to keep the soil in a high state of fertility. We cannot do this by growing corn year after year on the same land; neither can we do it by selling what we raise and return nothing to the soil. We might as well try to spend our money and at the same time try to keep it, as to keep removing the plant food from the soil by growing crops and returning nothing in the way of manure, or commercial fertilizers. For this reason, a system of farming must be practiced that will enable us to grow large crops and, at the same time, keep our land from getting poorer. The best farmers have found that a system of rotation in which a leguminous crop, such as clover, soy beans or cow peas, is grown, will maintain the fertility of the soil, provided the crops raised are fed to live stock and the manure returned to the soil and a sufficient application of lime, rock phosphate or potash is made on soils where it is needed. Such a rotation will necessarily have some one of the small grains as one of the crops.

It is not the purpose of this lesson to discuss the different kinds of small grain and their use in the rotation, but to take up the important things which are necessary to get the best results, whatever crop we choose to grow. We should know that our small grain seed will germinate as well as we should

know that our seed corn will grow. We should run the seed through a seed cleaner and remove all the dirt chaff and light seed and, if needed, we should treat the seed for smut. Too many of us neglect this until seeding time and then we haven't time to do it, while if the work is done earlier, we would not miss the time it takes.

The small grain should follow the corn and the grass seed put in with it. Thorough preparation of the soil will be best for both the small grain and grass seed. While a great many favor broad-casting the seed, on account of less labor being required in putting in the crop, it is generally considered a great advantage to use the drill for seeding. Less seed is required, (about one-half bushel per acre less), and it germinates and ripens more evenly and there is less danger of freezing out. When grass is seeded with it, drilling enables the light to reach the plants better, provided the drills run north and south, as they should. Then again, should a rain keep you out of the field a few days, you are not caught with seed sowed and not worked in. Finally, a drill is to be preferred because the seeding of both grain and grass seed can be done at the same operation.

If winter wheat is used in the rotation, it is probably best to put it in between the corn rows with a one-horse drill. While it is the least expensive method, it is usually the best method because the stalks catch the snow and prevent the wheat from winter killing. Many practice cutting the corn and then putting in the crop. In the northern sections, where the wheat is more apt to be winter killed, some practice sowing oats with it for added protection. When wheat is sown in the fall, the grass seed is usually sown in the spring, either early on the frozen ground or after the wheat is well started and then harrowed in.

Spring wheat and oats should be seeded as early as possible and the grass seed dropped broadcast in front of the discs, except in the drier sections, when it should be run in the drills with the small grain. The earlier varieties of oats should be used so the crop may be gotten off the land early and give the grass seed the full use of the land. It is sometimes advisable to cut the small grain for hay but usually the crop can be harvested in the ordinary way. Barley can be used but the seeding should be deferred till later in the season and the grass seed sowed the same as with oats or wheat. Barley requires a rich, well-drained soil and should not be sowed on any other kind. It is best to harrow the land after the drill on spring seeding when grass is put in, while in fall sowing, this should never be done. The reason for this is that the drill leaves the ground in ridges, which catch the snow and prevent the loss of soil by blowing.

While small grain is not usually so profitable to grow as corn, neither is it

so hard on the soil. It is almost a necessity when grass seed is to be sown. As the preparation of the soil which is best for the small grain, is also the best for the grass seed, the seeding may all be done at the same time, which is a great advantage. By seeding with small grain, the land may be seeded to grass without any loss in the use of the land. We should grow some kind of small grain if for no other reason than to enable us to seed down to grass, for what we lose in the value of the crop is surely made up by the aid rendered to the young grass in the early part of the season, by keeping down the weeds and allowing the light to reach the young plants.

LESSON XXXII.

TREATING THE SMUT.

I told you in our last lesson that the small grain seed should be treated for smut. Oats and wheat are affected and should be treated when the per cent of smut is more than three or four per cent. The per cent of damage may be easily determined by going into the fields after the grain has headed and estimating the damage. This may be done as follows: If the grain is drilled, measure off say three feet on a drill row and count the total number of stalks together with the number of smutted heads. Do this in several places in the field. If the grain is broadcasted, take a barrel hoop and drop it over the growing grain several different places in the field. Then count the total number of plants inside the hoop, together with the number of smutted heads. Dividing the number of smutted heads by the total number of plants, will give you the percent of smut. Should this reveal the fact that more than three or four per cent is affected, the seed should be treated before it is sown the following year.

Before taking up the method of treating for smut, we will first try to learn something about this smut and how it affects the growing grain. Smut is a parasitic enemy of oats and wheat, which means that it lives upon the wheat and oats plants. It does not grow from seed but from spores which are so small that hundreds of them are contained in a single smutted head. By the time the grain is ripe these smut spores have been blown from the heads, and some of them lodge under the hull of other good grains where they remain until the seed is put into the ground the following year. When the seed grain germinates the spore germinates also, but instead of growing down into the soil, it sends a tiny root into the plant and lives on the juices which the oats or wheat have taken from the soil. This is why it is called a parasite. When the grain heads out, instead of forming into good grains the heads are displaced by so many smut heads. They rarely destroy a part of the head but usually succeed in the destruction of all of the grains.

As the smut propagates by spores, it is necessary to treat the seed in order to destroy these spores. This should be done the day before the oats are to be sown. Only enough should be treated for sowing the following day. This can be done by spreading the grain out on the barn floor to the depth of three or four inches and sprinkling with a solution of formaldehyde until thoroughly damp and then spreading on more oats and sprinkling as before until all the grain has been dampened. This should be done in the evening and, after sprinkling, the oats should be shoveled up into a cone-shaped pile and covered with some old carpets, blankets or gunny sacks. This is to hold the fumes of the formalin in the seed. It has been found that this treatment is very effective in destroying the smut spores.

The formaldehyde can be obtained at any drug store and should cost about forty cents per pound. One pound is sufficient for each fifty gallons of water, and this amount of solution will treat from fifty to one hundred bushels of grain. Formaldehyde is a forty per cent of formalin and is not dangerous to handle. By covering as recommended, gas is formed which kills all living organisms. The next morning the covering should be removed and the seed shoveled over so as to dry the grain. It should be sowed at once. Careful observations have shown that when treated the amount of smut has been reduced to less than one per cent. As the cost is so slight no one ought to neglect it. Oftentimes as much as twenty per cent of loss is sustained by smut when at a cost of a few cents and a little work the entire loss could be avoided. Don't you think that this expense of time and money would be a profitable investment?

LESSON XXXIII.

ROTATION OF CROPS.—(LEGUMES.)

A legume is a plant that bears its seed in a pod such as clover, alfalfa, beans and peas. If you were to pull up a clover plant and examine its roots you would find some little knots or lumps on them. These are called nodules and are the homes of small living organisms called bacteria. These bacteria are found on the roots of all leguminous plants and are very essential to them. They have the power of taking free nitrogen from the air and storing it up in these little nodules in an available form for other plants to use. This is the reason why corn does so well following a crop of clover.

No rotation is complete unless a leguminous crop forms a part of it. The clover furnishes this need in the greatest part of the corn belt, although alfalfa, soy beans and cow peas are grown to some extent. The crop used varies with the climate, soil and the wishes of the grower. Good seed should always be used and should be free from weed seed. This is very important as some

of the worst weed pests have been sown on the land with clover and other grass seed.

As clover is the most universally used and is probably the best adapted to the many different parts of the country, it should not be thought of as the best crop to grow under all conditions, for such is not the case. In short rotations, however, clover is probably the best legume to grow. The great drawback to clover growing is that it is difficult to cure for hay unless the weather is very favorable, and is also hard to get a stand in adverse seasons. We should not be discouraged because of these drawbacks but should seed to clover every piece of ground that is put into small grain and endeavor, by the best care and methods, to overcome these obstacles. This can be done to a large degree by putting the seed in on well prepared soil, and by mixing timothy with the clover thus enabling us to take care of the hay crop to the best advantage.

Those who have the best success with clover, seed it with small grain and cover it well. They put on a full seeding of both clover and timothy, which is about eight pounds of clover and ten of timothy. If seeded with the drill the land is harrowed down smooth afterward. An early variety of grain is grown so it may be removed before the weather gets too warm. The first crop of clover is harvested early for hay and the second crop for seed. If the season is dry following the cutting of the first crop a good seed crop is often secured. In some seasons seed is found in the first crop in large enough quantities to pay to cut for seed, but most often the first crop is removed early so as to give the second crop time enough to develop seed before frost comes. If the clover blooms in dry weather, a good crop of seed usually results.

Good clover hay is very valuable for feed but does not command as high price on the market as timothy, probably because town people have not learned the value of clover hay as well as they have of timothy. Clover is better for all kinds of farm animals if fed in connection with corn. The corn furnishes the fat formers while the clover builds up the bone and muscle, and increases the milk supply. We can now readily see why young animals of all kinds relish the clover hay and do so well on it.

While clover hay will furnish in most cases a very profitable crop, yet the main reason for growing it should be to keep up the fertility of the soil. The clover enriches the land with nitrogen and also brings up phosphorus from the subsoil so that when the land is plowed up and put to corn the crop is much greater than otherwise. If fertilizer is applied it should be spread on the clover and plowed under. Lime and ground rock phosphate may be sown broadcast, while the manure should be put on thinly by hand or spreader.

Manure should be applied the same season the grass seed is sown while the other fertilizer should be put on just prior to plowing under. When manure is applied on any other than grass land it should always be spread on the land after it has been plowed, and disced into the soil. This keeps the crop from firing, as we call it, which is caused by the manure heating when plowed under. This does not occur to so great an extent when turned under with a green crop such as clover. By growing a leguminous crop every few years and applying fertilizer when needed, the soil may be kept in a high state of fertility even when a part of the crops are sold from the farm. Under this plan we are able to make more from the land and at the same time keep our land in better shape, freer from weeds and insect pests. In many respects will we profit by growing various kinds of crops instead of growing a single crop several years in succession, but the main benefits will come from our being able to keep up the fertility of the soil, and at the same time distribute our farm work so that all of it will not come at one time.

LESSON XXXIV.

ROTATION OF CROPS.—(GRAIN FARMING.)

While it is the best plan to feed live stock in connection with our farm operations, it has been found that the land may be kept in a high state of fertility by growing grain and selling it on the market. This will, of course, necessitate the applying of fertilizers in the way of ground rock phosphate or bone meal to the soil in sufficient quantities to supply what has been removed by the grain crops. Clover grown in the rotation will keep up the supply of nitrogen, while the return of all other growth to the soil together with the clover stubble plowed under will keep up the humus content.

Instead of putting up the clover for hay, it should be clipped back until late in the season, then allowed to make seed. The clover haulm should be returned to the soil together with all straw and corn stalks grown on the land. The straw can be spread thinly over the clover land and plowed under in the fall of the year. By this method the straw and green stubble are thrown in close contact and become thoroughly incorporated with the soil before the next crop is planted.

As corn is the most profitable grain crop, a rotation in which this crop forms a large part will of course yield the greatest income. In order to be able to rotate our crops at all we must first provide thorough drainage, both surface and underground. Corn then may be put on half the acreage each year. We can do this by dividing the ground to be tilled into four fields and growing corn on two of them and oats and clover on the remaining two. By seeding clover on one of the fields each year with the small grain, the nitrogen

content may be kept up, while the application of six or seven hundred pounds of ground rock prosphate to the acre on the clover just prior to plowing will furnish phosphorus to the extent it is removed by the growing crops. Lime should also be applied on acid soils in order that clover can be grown.

Under this system it will be seen that corn is grown two years on one field before seeding to small grain. Some crops like clover, cow peas, soy beans or even wheat or rye should be sown in the corn at the last cultivation. This will add to the humus content in the soil which is a very important item in keeping the soil from washing or running together after heavy rains.

While this system of farming is not recommended for adoption on a large scale, some farms may best be operated on this plan, owing to the fact that the owners are not fitted for any other kind of farming or are so fixed that they cannot adopt any other system. It should be remembered that no system of rotation should be followed that will not keep up the fertility of the soil regardless of whether we like it or not. We must learn that a mere changing of crops from corn to oats or wheat to corn is not a rotation and will only serve to render the soil poorer and poorer while the growing of legumes in the rotation will enable us to maintain, if not increase, the fertility of the soil.

LESSON XXXV.

ROTATION OF CROPS.—(LIVE STOCK FARMING.)

The crops grown in the rotation when live stock are kept do not vary much from those used under a system of grain farming. Of course the clover will be pastured or grown for hay and fed out on the farm instead of handling it as a seed crop. While this system will necessarily require more risk on the part of the farmer the added risk will usually be compensated by better crops and added fertility to the soil without so much expense for fertilizing material.

The kind of live stock handled will of course vary with the different farmers. Some will feed hogs, others cattle and still others sheep. It is needless to say that in whatever branch a person takes up, the very best class of animals should be fed provided they can be put into the feed lot at a reasonable price. The margin of profit is largely measured by the cost of the feeder animals, so they must be bought right if bought at all.

In a system of hog farming a four-year rotation with two years corn, one of small grain and one of clover would probably be best. This would mean that half the ground would be put to corn each year, which should furnish feed for one brood sow and litter for every two acres of corn. By sowing green crops with the corn and later hogging down, a large part of the fertility is left on the land and is properly distributed without the expense of handling.

One of the fields of corn should be handled this way and the other field husked in order to provide feed for the hogs the rest of the time. Following the second crop the land is seeded to small grain in which the clover is sown. The small grain should be fed out to the work horses or other stock while the clover should be pastured with hogs. Probably some of this acreage of clover could be pastured early in the season and later cut for seed. Should weather conditions be unfavorable for seed formation the hay could be put up and fed to the brood sows during winter.

In a system of cattle feeding the above plan may be varied to suit conditions. The main object of any system should be to manage the farm so as to make it pay, and at the same time keep up the fertility of the soil. In the feeding of cattle the silo should be used, for corn silage has proved to be the most economical of all feeds for this purpose. Where a system of rotation is established it has proven best to provide both a summer and a winter silo. The small grain and straw are consumed on the farm together with all the corn and clover crops. Under this system no fertility is removed except what is required for the growth of bone and muscle of the animals, provided, of course, that the manure is returned to the soil. If the older cattle are fed this loss is reduced to the minimum.

Sheep raising in connection with crop rotation can be made profitable but it will be necessary to have more of the land in pasture and hay crops (about three-fourths) than in any of the other plans. A person going into the sheep business should make it a close study; start in a small way and gradually work into it, for very often people find they do not like to work with sheep and of course should not continue in business under these conditions. Sheep should be provided with dry shelter and given good care at all times. Especially is this true when the lambs are arriving.

A great many have made money by buying lambs and feeding them for the market. Under this plan the acreage of pasture could be cut down and corn take its place. Plenty of clover hay and corn silage should be provided together with oats and corn for the grain ration. All of these can be raised on the farm, and by careful planning nothing need be sold off the farm except the fat animals. This would mean that the greater portion of fertility of the soil could be conserved.

There is no doubt that the practical way to manage most of the corn belt lands is to grow corn, small grain and clover and feed it to a good class of live stock and return the manure to the soil. The ration should be planned so as to make gains as economically as possible.

Every farm should have one or more good draft brood mares. These should be used for the farm work and should more than pay for their keep

by the colts they raise. It is a waste of time and feed to raise anything but a good class of colts. It does not take any more feed and care and their value is so much greater.

While each farm will present its own individual problems, by careful study anyone ought to make a success of some branch of farming outlined above. Let us hope that the time will speedily come when all land that is adapted to it, will be rotated systematically and be devoted largely to live stock farming. Under this plan the fertility of the soil could be maintained, if not increased, and the added wealth would amount to millions of dollars. There is no reason why our farmers should not be getting this added wealth, except that we don't study our own business as much as we ought. If every farmer would do as well as the best are now doing, the gain in wealth would be sufficient to provide everyone with a modern and comfortable home, with school facilities as good as the best we now have. This would mean a better civilization, which is really the most important thing to be desired in this life. Let us all strive to hasten the time when this state of affairs will be realized.

LESSON XXXVI.

ROTATION OF CROPS.—(DAIRY FARMING.)

While dairy farming requires a large investment, there is no type of farming that will enable us to increase the fertility of the soil so well as dairying, especially when butter is the only product sold. With dairying, about one-third of the acreage should be planted to each of the following crops: corn, oats and clover. Some of the clover could be used for pasture and some of the oats cut for hay if necessary. All of the crops should be consumed on the farm, and in most cases some additional feed purchased in the way of oil meal, cottonseed meal, or mill feed.

As in the case of live stock feeding it is bad practice to keep anything but first-class animals. The cows should produce at least 5,000 pounds of milk or 250 pounds of butter a year to be really profitable. It is an easy task to test out each cow by weighing the milk for say thirty days and testing with a Babcock tester. This will show exactly what each cow is capable of producing, and is very easy to do.

As in steer feeding, the silo should furnish the greater portion of rough feed. Silage fed in connection with clover hay, and this supplemented by corn and cob meal with some oil cake or other concentrated food, has proven to be equal to any system of pasturing. Under this system a great number

of cows can be kept but the labor would be somewhat increased. No doubt the soil is kept in better shape if large animals, such as cows and horses are not allowed to tramp around over it as they would if the land was pastured.

Presuming that all manure is returned to the soil and that only the best class of cows are kept the only drawback to dairying is the fact that it ties a person down closely. To be made profitable cows should be well housed and good care given at all times. This means that the dairy man must be on hand every day if the best results are to be expected. This does not appeal to everyone, and unless a person likes to milk and care for cows, he will not get the best results. However, the person who will take pains, and properly manage his work, dairying will well repay his efforts both in the income afforded and the increase in the value of his land. By providing the proper equipment, and managing the feed problem systematically a large part of the harder work can be eliminated. When this is done dairying should appeal to more people than it now does.

As was stated in the beginning of the lesson, when butter only is sold off the farm, the fertility can be kept up and the physical condition of the soil made better under a system of dairy farming than in other plans. This presumes that all manure is returned to the soil together with the corn stalks and straw produced on the farm. The profit will of course be measured by the class of cows kept and the skill employed in the management, but it is reasonably certain that, if as much attention is given to dairying as is necessary to succeed in other lines, good results may be expected. Certain it is that farms devoted to the dairy business get richer and richer which should appeal to any one who is interested in building up his soil, instead of impoverishing it by irratonal systems of farming. Let us hope that more of us will take up dairying and by so doing retain the fertility of the soil. If this were done on all lands, we could in a short time boast of the fact that although greater crops were raised and larger incomes produced the soil with all its wealth of golden fertility would be maintained which is the most important thing to be considered. Every person, no matter what system of farming he follows, should be able to turn the land over to his successor as good if not better than when he took it. Dairy farming will enable one to do this, if there is any branch of farming that will.

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